MoreLKS: Manual for a Computer Programme on Cameroonian Lesser-Known Timbers and End-Use Requirements

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Tropenbos-Cameroon
Documents 2

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Manual version 1.2
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The TCP is a research programme executed under the joint responsibility of the Ministry of Environment and Forests of the Republic of Cameroon and the Tropenbos Foundation

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ABSTRACT

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MoreLKS, version 2.01 k, is a computer model for assessing the suitability of tropical timbers for major end-uses on the European and Cameroonian markets. It allows a comparison of various Cameroonian lesser-known species with many other timbers. The manual provides a detailed description on how to use the model.

Key words: lesser-known timbers, timber quality, Cameroon

WAGENINGEN UNIVERSITY

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TABLE OF CONTENTS

FOREWORD 3

INTRODUCTION 5

HOW TO USE THE MANUAL 7

1. **OVERVIEW** 8
   - Why the MoreLKS program was developed 8
   - Cameroonian lesser known species added 9
   - hardware requirements 11
   - A quick tour around 12

2. **USER'S GUIDE** 15
   - Installation and set-up 16
   - Help system 17
   - Menu system 18
   - Entering species 19
   - Screening species 21
   - System and utilities 24

3. **PROPERTIES AND END-USES** 25
   - The properties 25
   - End-use criteria 30

4. **REFERENCE GUIDE** 32
   - Menus 32
   - Printing 44
   - Files and their description 45
   - Error messages 46
   - Memory problem 48

REFERENCES
- Literature for the African timber species 49

INDEX 51

APPENDICES

- A: Classification of the properties and grades 55
- B: List of botanical names (African species) 59
- C: List of botanical names (other species) 63
- D: List of trade names (African species only) 66
- E: Condensed screening results for species 71

FOREWORD

About Tropenbos
The Tropenbos Foundation was established in 1988 by the Government of the Netherlands with the objective to contribute to the conservation and wise use of tropical rain forests by generating knowledge and developing methodologies, and to involve and strengthen local research institutions and capacity in relation to tropical rain forests.

The Tropenbos Programme carries out research on moist tropical forest land at various locations around the world. At present (semi-) permanent research sites are located in Colombia, Guyana, Indonesia, Côte d'Ivoire and Cameroon. At the different locations, research programmes follow an interdisciplinary and common overall approach, with the aim to exchange data and make results mutually comparable.

About the Tropenbos-Cameroon Programme and ITTO Project PD 26/92
The present publication has been produced in the framework of ITTO Project PD 26/92, which is an integral part of the Tropenbos-Cameroon Programme (TCP). The Tropenbos-Cameroon Programme was established in 1992 by the Cameroonian Ministry of Environment and Forests (MINEF) and the Tropenbos Foundation.

The general objective of TCP is to develop methods and strategies for natural forest management directed at sustainable production of timber and other forest products and services. These methods have to be ecologically sound, socially acceptable and economically viable. TCP consists of fourteen interrelated projects in the fields of ecology, forestry, wood science, economy, social sciences, agronomy and soil science (for a description of these projects, see Foahom & Jonkers, 1992. *A programme for Tropenbos research in Cameroon.* The Tropenbos Foundation, Wageningen, the Netherlands).

In 1994, ITTO and CfC decided to co-finance six of these projects, which together form ITTO project PD 26/92. The *'Office National de Développement des Forêts'* (ONADEF) is the agency responsible towards ITTO and CfC for the implementation of the Project PD 26/92. The research on which this publication is based, was financed by the International Tropical Timber Organization (ITTO), the Tropenbos Foundation and the implementing agencies Wageningen Agricultural University (WAU) and ONADEF. ITTO provided by far the largest financial contribution.

About the present study
The MoreLKS software programme used in the present study is based on an earlier version of the same programme, developed by an earlier ITTO project (project PD 18/78). The program was expanded by adding 30 lesser-known timbers from Cameroon and a number of end-uses relevant for the Cameroonian local market. The revised programme permits the user, who seeks suitable timber for a specific application, to compare the qualities of Cameroonian lesser-known timbers with a wide range of other timbers.

The software has its limitations, however. Only common applications are included in the database, and if the information on a species is incomplete, MoreLKS may rank the species wrongly as unsuitable because a certain essential quality is unknown, and therefore assumed to be very poor. The programme has been devised in such a way, that the last limitation can be reduced in the future, when more information becomes available. New data can be added, and it is also possible to add other species.

The revised MoreLKS programme was designed to provide the Cameroonian timber sector with a powerful tool to promote timbers, which are presently difficult to sell. If such promotion is successful, the sector can broaden the range of species harvested. This would help Cameroon not only in making a fuller use of its timber resources, but also in achieving sustainable forest management. Sustainable forest management can only be accomplished if sufficient trees of each timber species are preserved for future yields. This becomes easier when more species are marketable.

Dr W.B.J. Jonkers
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Tropenbos-Cameroon Programme

INTRODUCTION

This manual describes the use of a computer model for assessing the suitability of tropical timbers for a variety of end-uses. The model is a modification of the MoreLKS model, prepared in the framework of ITTO project PD 18/87 rev. 1(1). This version was produced in the framework of ITTO project PD 26/92 rev. 2, which in its turn is an integrated part of the Tropenbos-Cameroon Programme. The computer program was adapted especially for Cameroon and includes, besides the species incorporated in the original model, 30 common lesser-known Cameroonian timbers. The model is a tool for Cameroon to promote its timbers on the national and international markets. It is also used by the Tropenbos Cameroon Programme to predict which species may become marketable in the future, and therefore should be considered as such in forest management and silvicultural studies.

MoreLKS is the abbreviation of Matching Of Requirements of End-uses with Lesser-known Species (LKS), a software program written for IBM-compatible computers. The program shows the applicability of a timber for five major end-uses in western Europe and some end-uses for the local market in Cameroon, based on a number of technological properties. This is the user's manual for that program. Although this manual is in English, it is possible to select the French language in the computer program. This will make it easier for French oriented users to benefit from the program.

The system is based on the principle of screening a number of material-specific properties of timber against formulated end-use criteria, on two different quality levels: the preferable and the minimum level. The result of a screening will be expressed by the classification "acceptable" or "non-acceptable" for one of the two levels and furthermore by expressing the degree of suitability for the relevant specific end-use, based on the qualitative potential of a wood species. These parameters result in a final outcome concerning the suitability or non-suitability of a timber species for one of the specific end-uses involved.

The programme allows adjustments and enlargement of the database. New data and new species can easily be entered. The programme also allows comparison with other timber species, as data on more than 200 tropical timbers are provided.

Acknowledgements

We thank the International Tropical Timber Organization and the Tropenbos Foundation for funding the development of the programme and the publication of this manual. Furthermore, we would like to thank the Prospect-team from Oxford Forestry Institute for making information available. Also we thank the CIRAD-Forêt for supplying data to the original database. End-use requirements for western European end-uses have been made available by Mr P.B. Laming. Last but not least we would like to thank Dr W.B.J. Jonkers for his critical review of this document.

HOW TO USE THE MANUAL

This manual for the MoreLKS programme is divided into five sections.

Where to find what:

To get an overview of the programme and project:

- ▸ consult the "OVERVIEW" section.

For installation and use of the programme:

- ▸ consult the "USER's GUIDE" section.

Searching for a word:

- ▸ consult the "INDEX" section.

Information on properties and end-uses:

- ▸ consult the "PROPERTIES AND END-USES" section

Look up menus:

- ▸ consult the "REFERENCE GUIDE" section

Is a species present?:

- ▸ consult APPENDIX B, C or D.

Conventions used:

In this manual the keys on your keyboard are shown in uppercase. (for instance : RETURN, PGUP or SHIFT). Text to be typed by you is indicated by another font: `like this`.

OVERVIEW

This section provides information on the potential use of the program and why it was made. A short step-by-step training is included.

Why the MoreLKS programme was developed
MoreLKS was developed to provide information on the potential marketability of timber species which are not or seldom used at present. This information can be used in estimating the economic value of the forest, and in preparing a list of species which are likely to contribute to future harvests. The project also has an important commercial application, that is, it will facilitate the promotion of lesser-known timbers on the local and international markets.

There are several hundreds of Cameroonian tree species which are not or seldom harvested in commercial timber exploitation, but which qualify for introduction on the national or international timber market (see Samgba Ahanda, 1991; Erfurth and Rushe, 1976). The use of such lesser-known timber species from Cameroonian rain forest is considered desirable because:

- it leads to an increase in economic value of the forest, and may therefore stimulate management aimed at sustained timber production;
- the present logging intensity in Cameroon is low and can presumably be somewhat increased if more species are used, without jeopardizing the functioning of the ecosystem;
- an increase in yield per hectare reduces costs of logging and silvicultural operations per unit product;
- diversification of timber production may lead to reduced exploitation pressure on highly valued timber species, to prevent that these species become rare or extinct and to allow the retention of good-quality trees for silvicultural or forest management purposes.

Harvesting more species implies that a market should be found for these species, and that these timbers should meet the requirements of timber consumers. These requirements cannot be generalized; they differ per end-use and also depend on local conditions (e.g. climate). It is therefore important that the suitability of tree species for specific end-uses is known, and the present study is to gather such information.

Selection of timbers used in the consuming countries is, besides price, availability, practical influence and fashion, usually based on their specific technological and physical properties.

These required properties are dictated by the intended end-uses. Marketing of timber by the producing countries would be helped enormously if producers were aware of specific end-use markets so that they could offer their products with a fair chance of success.

To date all efforts to promote the utilization of lesser-known and lesser-used species have been made with what could be offered at the production end in mind. Most of these efforts have not been very successful for various reasons.

More success could be expected if the approaches were based on the demand for specific properties for each defined end-use. This has been shown recently for the introduction of some species from Malaysia into the western European market. Therefore, the most important end-uses for western Europe have been analyzed and made available for practical use through this programme for exporters and other interested parties.

Cameroonian lesser-known species added
Thirty timber species and their properties were added to the existing MoreLKS database. These species were selected as follows:

- first, results of the national forest inventory and other surveys in Cameroon were studied to prepare a list of all timber species and their abundance. In case only vernacular names were used in the inventory, the botanical identity was verified;
- From this list, commercially well accepted species and other species already in the MoreLKS database or the Dutch practical timber guide were deleted;
- species which generally do not grow to timber size or which have other disqualifying features were also deleted, and so were a few species which are very important for the local population as source of non-timber products;
- from the remaining list, thirty species were chosen to be added to the database on the basis of available information on timber properties and common occurrence in Cameroon.

This procedure resulted in the following list (see next page):

Trade name	Botanical name	Family
Angoayeme	*Albizia zygia*	Mimosaceae
Saliyemo	*Albizia adianthifolia*	Mimosaceae
Aningre	*Aningeria spp.*	Sapotaceae
Akoung ele	*Anthonotha cladantha* (*Macrolobium cladanthum*)	Leguminosaceae
Awonog	*Blighia welwitschii*	Sapindaceae
Nom tonso	*Cleistanthus polystachyus*	Euphorbiaceae
Avom	*Cleistopholis patens*	Annonaceae
Ebe	*Cordia platythyrsa*	Boraginaceae
Nganga	*Cynometra hankei*	Caesalpiniaceae
Omang	*Desbordesia glaucescens*	Irvingiaceae
Eyoum P	*Dialium dinklagei*	Caesalpiniaceae
Eyoum G	*Dialium spp.*	Caesalpiniaceae
Moambe jaune	*Enantia chlorantha*	Annonaceae
Landa	*Erythroxylum mannii*	Erythroxylaceae
Mutondo	*Funtumia africana*	Apocynaceae
Mvanda	*Hylodendron gabunense*	Caesalpiniaceae
Andok ngoe	*Irvingia grandifolia*	Irvingiaceae
Abip ele	*Keayodendron bridelioides*	Euphorbiaceae
Kumbi	*Lannea welwitschii*	Anacardiaceae
Dibetou	*Lovoa swynnetonii, L.trichilioides*	Meliaceae
Oboto	*Mammea africana*	Clusiaceae
Bete	*Mansonia altissima*	Sterculiaceae
Assila omang	*Maranthes inermis*	Chrysobalanaceae
Zingana	*Microberlinia bisuculata*	Caesalipiniaceae
Bahia	*Mitragyna (Hallea) ciliata*	Rubiaceae
Nom atui	*Newtonia spp.*	Mimosaceae
Ozek	*Odyendyea gabonesis*	Simaroubaceae
Ebai bekwe	*Pentaclethra eetveldeana*	Mimosaceae
Sikon	*Pteleopsis hylodendron*	Combretaceae
Ebebeng	*Margaritaria discoidea* (= *Phyllanthus discoideus*)	Euphorbiaceae

Unfortunately, the available information on timber properties of these 30 species is not always complete. As MoreLKS rated the absence of information as negative, a species may wrongly be rated as not suitable for some end-uses.

HARDWARE REQUIREMENTS

Introduction
The computer programme was intended to be used on low-end PCs. It is possible to run the programme without any problems on PCs from the last ten years. In order to use this programme you should have :

- An IBM-compatible computer with a hard disk (PC, XT, AT, PS/2 or true compatible) with 640 K RAM internal memory.
- The MS-DOS or PC-DOS operating system (version 2 or later).
- Floppies to make a back-up of both data and programme.

What may also be used

- A graphic display (preferably with a colour monitor)
- Printer

It is possible to run this programme on computers equipped with Microsoft Windows 3.1 and Windows 95/98, using a DOS-application box.

The programme will not operate properly on 256 Kb machines but these can be considered as being outdated.

A QUICK TOUR AROUND

Introduction
This chapter will demonstrate what the output of this programme will be and what you need to do. First, you should have installed the programme on your computer. If this has not yet been done, then please do so now. We will -as an example- test the suitability of Teak (*Tectona grandis*) for windows and doors.

Start the programme
After switching on the computer and waiting for the prompt, select the proper directory, type `MoreLKS` and press RETURN. The programme shows a starting screen and, after pressing RETURN, will load information.

Select a database file
You will then be prompted to choose one of the existing files which contain information on the properties of timber species. Please select the ALL file from the files listed (using the ARROW keys and press RETURN). After the file is loaded, the main menu appears.

The main menu
Now, let's see what the properties are for a species of -for instance - Teak (*Tectona grandis*). To do this we should go to the database section. Select the option "Change the properties Database" (with ARROW) and press RETURN. We are now in the Database section of the programme.

Database menu
We will now go to the option "View wood species" and select it by pressing RETURN.

View a timber species
On the screen we can see the species included in this data file. One of them is *Tectona grandis*. Select this species (by moving with the ARROW and pressing RETURN). If you wish, more species can be selected. The selected species are highlighted. Leave this menu by pressing F10.

Properties of *Tectona grandis*
On the screen you will see the properties of *Tectona grandis* (as far as these are necessary for the end-uses we have prepared). Press ESC to leave this screen and to go back to the Database menu or press F10 if more species were selected.

Suitability for the selected end-uses
To see whether a certain timber is suitable for one of the selected end-uses we need to go back to the Main menu. We can do this: select the option "Quit database manager" and press RETURN. The programme will display the main menu seen previously. Now select the option "Select and match properties with requirements" (by moving the ARROW) and press RETURN.

Selection menu
Please select the first option (the "Choose selection" option), which is already highlighted, and press RETURN.

Select species
Move from the species listed to *Tectona grandis* using the ARROW and select this species by pressing RETURN. If you wish, more species can be selected. The selected species are highlighted. Leave this menu by pressing F10.

Select end-uses
Here you can choose between the various end-uses. Please select windows and doors, by moving the ARROW and pressing RETURN to select. Leave this menu by pressing F10.

The evaluation display
The programme will now display the suitability of the first selected species for the first selected end-use. In this case the programme will show the suitability of *Tectona grandis* for doors. You can press F1 for help (use PGDN and PGUP to move through the help text and press ESC to leave help). Press RETURN to find out the suitability of the next selected end-use (in this example: doors), based on the end-use requirements and the properties of the timber.

The meaning of the evaluation display
The properties of the selected timber are compared with the end-use requirements of the selected end-use. This is done at two levels of acceptance: a preferable and (if the species does not meet all requirements) a minimum level.

The bars shown on the screen are the result of the comparison. Depending on your computer, you will see coloured or pattern-filled bars. The key for the colours and patterns are displayed at the bottom of the screen. The number above the bar indicates the property number (numbers and properties are shown by pressing F1). When a property does not meet the requirements for the current end-use, it will be displayed on the right of the screen under the heading "Properties not sufficient". Under the evaluation of the properties you will see three boxes which give the result of the screening.

The boxes
The first box (Result) shows the result of the screening. It has three possible outcomes:

- Meets requirements at the preferable level
- Meets requirements at the minimum level
- Does not meet requirements

The second box (Hint) gives an indication by a total add-up of a point system which takes into account the relevant properties for the selected end-use.

The third box (Practical evaluation) displays the overall result by taking the previous boxes into account.

The practical evaluation:
Tectona grandis is a "good species" for windows because:
it "meets minimum requirements" (Result) and "might be very suitable" (Hint)

Tectona grandis is a "fairly good species" for doors because:
it "meets minimum requirements" (Result) and "might be suitable" (Hint)

How to leave the programme
Keep pressing ESC until you reach the main menu.
Select the option "QUIT programme" and press RETURN twice.

USER's GUIDE

What is to be found
You can find the procedure you should follow to install the programme and prepare it for use.

There is a chapter on the help system, one on the menu system, one on entering timber species, one on the screening process and one on the set-up and utilities part of the programme.

Introduction
This chapter allows you to install the programme from the floppy disk onto your hard disk and prepare the programme for use.

Start the computer
Switch the computer on and wait until the prompt is displayed.

Make back-up of disk
You are advised to make back-up copies of the original programme disk before you use the programme. Keep the original disk in a safe place.
You can use the DOS command DISKCOPY to make a back-up of the programme.

Installing the programme onto your hard disk
To install the programme onto your hard disk:

-1 insert the floppy with the programme into disk drive A and close the drive door
-2 type `A:` and press RETURN
-3 type `INSTALL` and press RETURN

The programme will be copied onto a sub-directory MORELKS on your hard disk (if available). Also, a so-called batch file will be copied onto the root of your hard disk.

If you wish to install the programme onto another drive or directory, you should use the DOS-command `COPY` to copy all the programme files onto the drive and directory of your choice.

Set-up of programme
Depending on the graphic card of your computer the programme will use a black and white display (Hercules, CGA, EGA) or colour (VGA). In the set-up of the programme you can alter the settings. Screen colours can also be altered to your own liking.

Help system

Introduction
This chapter describes the help system and how to use it.

Context sensitive help
This programme will display context sensitive help in most cases. This means that you will obtain information on the particular part of the programme you are currently using. You will obtain information about the choices you can make and/or the keys which have a particular function.

Pressing F1 (the first function key on your keyboard) will display the help if available.

In many cases, the help information will be concise. However, the amount of information sometimes exceeds the space on the screen. In that case, you may move the cursor with the ARROW or PGDN to reach the extra information.

General help
The main menu offers the option "How to use the programme".
This option can be used to obtain more general information (not context sensitive).

Keys in effect

F1	Will display context sensitive help if available.
ESC	Leaves the help screen.
ARROW	Moves the cursor.
HOME	Moves the cursor to the beginning of the help text.
END	Moves the cursor to the end of the help text.
PGUP	Moves the cursor to the previous page of the help text (if available).
PGDN	Moves the cursor to the next page of the help text (if available).
F5	Enlarges the help text to full screen (or back to the original size).

Menu system

Introduction
This chapter will help you to become familiar with the menu system and what to do with the menus.

The two menu types
There are two different menu types: single selection and multiple selection.
Single selection offers the possibility of selecting only one of the listed items.
The main menu is an example of such a menu.
Multiple selection makes it possible to select more than one of the listed items.
The "Select the species" menu is an example of this.

Keys in effect

Move the cursor:

Key	Function
ARROW UP	Moves the cursor one item up.
ARROW DOWN	Moves the cursor one item down.
HOME	Moves the cursor to the beginning of the item list.
END	Moves the cursor to the end of the item list.
PGUP	Moves the cursor to the previous page of the item list (if available).
PGDN	Moves the cursor to the next page of the item list (if available).

Select or deselect an item:

RETURN	Selects the item.
ENTER	Selects the item.
Alpha num. keys	Selects first item starting with that character [1].

Leave the menu:

F10	Accept choice(s) made.
ESC	Cancel the current menu without accepting any choice.

Get help:

F1	Will display a help text.

[1] This will not work in the menu for selecting species or uses.

Entering species

Introduction
This chapter describes how to include new species in the programme.

Active database file
Species in the selected data file can always be viewed, added or deleted.
You can change the active database file using the "Make or Use other database file" option in the database menu. You will be prompted to select the file to be loaded. We suggest strongly that you do not add species to the existing files but make some species files of your own.

It is possible to modify properties of species but not of the species provided.
If you wish to alter the properties of the species provided, you cannot do it straight away. You can make a copy of the information provided by viewing a species and then - possibly after selecting your new file- use the option "Use old values". The changes can then be made permanent.

Filling in the properties
To enter a new species:

- Type the botanical name of the species and press RETURN. It is possible to use the ALT key in combination with the digits on the numerical key path to get special characters such as ¥, á, ì, ï, è, ê, ç, å, Ç, é, etc. During the screening process, however, these characters might not be visible on the screen when in graphical mode on some graphical cards.
- If you wish, you can enter the source and the commercial name(s); you can also enter a special message concerning the wood.
- Select hardwood or softwood.
- Enter the properties by moving the cursor to the required property field and press RETURN to obtain a menu from which you can make a choice. However, there are two exceptions: the density and modulus of rupture require an ordinary number.
- The grain and the region field can accept more than one choice.

Saving the information
When the properties have been entered, the species can be saved by pressing F10. Note: if properties have not been entered, the programme will issue an error message: you should fill in these properties before saving.

Leaving the menu without saving the information
Press ESCape.

Keys in effect

Move the cursor:

Key	Function
TAB	Move cursor to the next field.
ARROW UP	Moves the cursor one field up.
ARROW DOWN	Moves the cursor one field down.
HOME	Moves the cursor to the beginning of the screen.
END	Moves the cursor to the bottom of the screen.
RETURN	Activates a list to choose or goes to the next field.
ENTER	as RETURN.

Leave the menu:

F10	Save the information.
ESC	Leave the menu without saving.

Get help:

F1	Will display a help text, containing information on the currently active property field.

Changing species

The properties of species can be changed if the species concerned is not included in the original database.
(see active database file).

Screening the species

Introduction
This chapter supplies information on the use of the selection menu.

Selecting the species and end-uses
The selection menu has three options for selecting the species and end-uses that you can screen.

- The "Choose selection" option allows you to choose from the total list with nothing pre-marked.
- The "Use or alter previous selection" option allows you to choose from the total list with the previous selection(s) pre-marked.
- The "Retrieve selection file" option allows you to load an earlier selection[1] (previously saved) from disk. You can use this selection if you select the "Use or alter previous selection" option.

The evaluation display
Following the selection of at least one species and one end-use, the programme will display the suitability of the first selected species for the first selected end-use.

Note:This is based on the end-use requirements and on the properties of the timber, other -also important- factors are not (yet) evaluated in this programme.

The meaning of the evaluation display
The properties of the selected timber are compared with the end-use requirements of the selected end-use. This is done at two levels of acceptance: a preferable and (if the species does not meet all requirements) a minimum level. The bars, shown on the screen, are the result of the comparison. Depending on your computer and choices made in the setup menu, you will see coloured or pattern-filled bars. The key for the colours and patterns are displayed at the bottom of the screen. The number above the bar indicates the property number (numbers and properties are shown after pressing F1).

When a property does not meet the requirements it will be displayed on the right of the screen under the heading "Properties not sufficient" under the appropriate sub-heading (preferable or minimum level). Below the evaluation of the properties you will see three boxes which give the results of the screening process.

[1] The selected species must at this time be present in the selected database file.

The boxes
The first box (Result) shows the result of the screening. It has three possible outcomes:

- Meets requirements at the preferable level
- Meets requirements at the minimum level
- Does not meet requirements

The second box (Hint) gives an indication by a total add-up of a point system which takes into account the relevant properties for the selected end-use.

The third box (Practical evaluation) displays the overall result by taking the previous boxes into account.

The properties
The properties screened for an end-use are not displayed as text, since the amount of space is too limited. Instead, a number is written on the screen denoting the corresponding property. If you wish to know the property for a certain number the following list will be helpful. (During the screening process this list is part of the context sensitive help).

Number	Property
1	Natural durability
2	Density low
3	Density high
4	Modulus of rupture
5	Grain
6	Texture
7	Reaction wood
8	Shrinkage
9	Tendency to exude gum or resin
10	Tendency to corrode and stain metal
11	Staining of neighbouring materials
12	Tendency to splinter
13	Staining
14	Drying rate
15	Tendency to checking
16	Tendency to distortion
17	Blunting effect on tools
18	Machining
19	Nailing
20	Gluing
21	Effect of wood substances on finishing
22	Finishing

For further explanation of the properties refer to the section "Properties and End-uses".

Keys in effect:

General:

ESC	Press ESCape to stop
BREAK	stop the complete programme (a crude method).
F1	HELP: press function key 1 to get this text.

Movement through the selected species and end-uses:

HOME	go to the first selected end-use and the first selected species
END	go to the last selected end-use and the last selected species.
Left ARROW	go to the previously selected species (with current end-use)
Right ARROW	go to the next selected species
Up ARROW	go to the previously selected end-use.
Down ARROW	go to the next selected end-use
CTRL ARROW	go six positions further in direction ARROW (so six species forwards or backwards)

Special:

TAB	View or change the current species. This is a shortcut to the database part of this programme. Pressing ESCape will bring you back to the selection part. Pressing F10 will make the changes you have made permanent if allowed (See "Changing properties").

Note: If you try to reach beyond the selected range (for example before the first selected species, or after the last species) the programme will make a sound and display the currently active end-use and species.

Any other key will go to the next selected species, or -after the last species- to the next end-use with the first selected species. If this also was the last, the display will stop. (However: the keys: CAPSLOCK, CTRL, ALT, SCROLL LOCK and NUMLOCK have no effect. PRINT SCREEN will usually not work with your printer, except when you are in text mode).

Find the best case for the selection

The screening described above can be speeded up. The option "Find the most appropriate use for the selected species" will search and display the highest category of the practical evaluation. This is done for all selected species. It also gives the end-uses for that category.

System and utilities

Introduction
This chapter demonstrates how the installation and set-up menu can be used as well as the utilities menu.

Set-up and installation
In this menu you can change and save the screen-type and preferred colours. If you do not have a computer capable of displaying colours, then select the black and white option.
You can choose the graphic option: this only affects the display during the screening process.
To make presentations possible on simple laptops you can choose option Text. The display will then stay in the so-called "Text mode".

Utilities
In this menu you can copy the files with information on species. You can copy them to and from floppies using this menu. If a new version of the programme needs to be installed, you can use the option "install new version".

PROPERTIES AND END-USES

This chapter will give you extra information on the properties and the end-uses concerned.

Properties

A selection of properties relevant to the end-uses involved has been made. The data on species can be entered quite simply, choosing from predetermined classes. The properties used are described below and the classes can be found in appendix A.

Properties of the timber

General Wood Characteristics:			
Natural durability	(1)	Texture	(6)
Density	(2,3)	Reaction Wood	(7)
Modulus of rupture	(4)	Shrinkage	(8)
Grain	(5)		
Special Wood Characteristics:			
Tendency to exude gum or resin	(9)	Staining of neighbouring materials	(11)
		Tendency to splinter	(12)
Tendency to corrode and stain metal	(10)		
Technological Properties:			
Staining	(13)	Machining	(18)
Drying rate	(14)	Nailing	(19)
Tendency to checking	(15)	Gluing	(20)
Tendency to distortion	(16)	Effect of wood substances on finishing	(21)
Blunting effect on cutting tools	(17)	Finishing	(22)

The botanical name and region should be entered, as well as whether the timber is a hardwood or a softwood. Entering the source of information and trade names is optional.

Note: The numbers after the properties refer to the numbers shown on the screen in the reference section.

END-USE CRITERIA

Introduction

Criteria have been drawn up for the selection of timber for the mentioned end-uses. The current national requirements of the different western European countries have, if available, been taken into consideration as much as possible. Establishing criteria for end-use requirements took place in consultation with a number of institutes in the field of timber research and timber promotion. Also, some local end-use requirements have been drafted for the cameroonian situation.

End-uses

The specific end-uses involved are:

- Windows (frames, sashes, sills etc)
- Solid panel doors (external)
- Cladding - external walls (weather boarding, bevel siding etc.)
- Solid wooden furniture parts (chair and table frames, upholstery framing, chair seats) and cabinet work (table tops, bases, legs etc.)
- Flooring for normal pedestrian traffic (less than 2000 persons per day) and flooring for heavy pedestrian traffic (more than 2000 persons per day) e.g. strip flooring, block flooring, parquetry.

The last four end-uses are also available for Cameroonian conditions.

The system

The system is based on the principle of screening a number of material-specific properties of timber against formulated end-use criteria, at two different quality levels. The result of a screening is expressed by the classification "acceptable" or "non-acceptable" for one of the two levels and furthermore by expressing the degree of suitability for the relevant specific end-use, based on the qualitative potential of a wood species. These parameters result in a final outcome concerning the suitability or non-suitability of a timber species for one of the specific end-uses involved.

The following pages consist of the criteria tables with their notes. The notes are numbered consecutively and are to be found on the following pages.

Note: The information on the following five pages has been taken from the TNO-report by P.B. Laming (1990):"SELECTION OF LESSER-KNOWN AND LESSER-USED TIMBER SPECIES FOR SPECIFIC END-USES BASED ON THE SYSTEM OF THE WOOD PROPERTY AND END-USE REQUIREMENTS", (HI 90.1066 600769504).

Criteria for the selection of timber for the manufacture of windows (frames, sashes, sills, etc)

TIMBER PROPERTIES	PREFERABLE LEVELS	MINIMUM LEVELS
Natural durability of heartwood (1)	durable to very durable or moderately durable but capable to effective treatment (2)	perishable to non-durable but capable to effective treatment (2)
Density	softwood: 450 kg/m3 or more hardwood: 500-850 kg/m3	softwood: 400 kg/m3 or more hardwood: 450 kg/m3 or more
Grain	straight to moderately interlocked	
Reaction wood	absent	no requirement
Shrinkage	small or medium	large
Tendency to exude gum or resin	absent after drying	slight after drying (3)
Tendency to corrode metals and staining in contact with metals	absent or controllable if present	
Staining neighbouring materials	absent or controllable if present	
Drying rate	rapid or moderate	rather slow or slow/very slow (4)
Tendency to checking during drying	absent or controllable if present	
Tendency to distortion during drying	absent or controllable if present	
Machining	good, or satisfactory when tipped cutters are used and/or modified cutting angle	
Blunting effect on cutting tools	slight to moderate	severe if tipped cutters are used
Gluing	good	satisfactory or good after pre-treatment or newly machined
Finishing (5)	good	satisfactory; if necessary after pre-treatment or newly machined

Criteria for the selection of timber for the manufacture of solid panel doors (external)

TIMBER PROPERTIES	PREFERABLE LEVELS	MINIMUM LEVELS
Natural durability of heartwood (1)	durable to very durable or moderately durable but capable to effective treatment (2)	perishable to moderately durable but capable to effective treatment (2)
Density	softwood: 450 kg/m3 or more hardwood: 500-850 kg/m3	softwood: 400 kg/m3 or more hardwood: 450 kg/m3 or more
Grain	straight to moderately interlocked	
Reaction wood	absent	no requirement
Shrinkage	small	medium
Tendency to exude gum or resin	absent	infreqeumtly after drying (3)
Tendency to corrode metals and staining in contact with metals	absent or controllable if present	
Staining neighbouring materials	absent or controllable if present	
Drying rate	rapid or moderate	rather slow or slow/very slow (4)
Tendency to checking during drying	absent or controllable if present	
Tendency to distortion during drying	absent or controllable if present	
Machining	good, or satisfactory when tipped cutters are usewd and/or modified cutting angle	
Blunting effect on cutting tools	slight to moderate or severe if tipped cutters are used.	
Gluing	good	satisfactory or good after pre-treatment or newly machined
Finishing (5)	good	satisfactory; if necessary after pre-treatment or newly machined

Criteria for the selection of timber for the manufacture of cladding - external walls (weather boarding, bevel siding, etc.)

TIMBER PROPERTIES	PREFERABLE LEVELS	MINIMUM LEVELS
Natural durability of heartwood (1)	durable to very durable or moderately durable but capable to effective treatment (2)	perishable but capable to effective treatment (2)
Density (6)	softwood: 350 kg/m3 or more hardwood: 450 kg/m3 or more	
Grain	straight to moderately interlocked (7)	
Reaction wood	absent	no requirement
Shrinkage	small or medium	large
Tendency to exude gum or resin	absent	slightly after drying (3)
Tendency to corrode metals and staining in contact with metals	absent or controllable if present	
Staining neighbouring materials	absent or controllable if present	
Tendency to checking during drying	absent or controllable if present	
Tendency to distortion during drying	absent or controllable if present (7)	
Machining	good, or satisfactory when tipped cutters are used and/or modified cutting angle	
Blunting effect on cutting tools	slight	moderate
Nailing (8)	good	satisfactory, without preboring
Finishing (9)	good	satisfactory; if necessary after pre-treatment or newly machined

Criteria for the selection of timber for the manufacture of solid wooden furniture parts (chair and table frames, upholstery framing, chair seats) and cabinet work (table tops, bases, legs, etc.)

TIMBER PROPERTIES	PREFERABLE LEVELS	MINIMUM LEVELS
Density (10)	averaging not less than 550 kg/m3 and not more than 850 kg/m3	averaging not less tha 450 kg/m3 and not more than 950 kg/m3 (11)
Modulus of rupture	not less than 80 N/mm2	not less than 65 N/mm2
Grain	straight	moderately interlocked (12)
Reaction wood	absent	no requiresent
Shrinkage	small or medium	large (13)
Tendency to exude gum or resin	absent or slightly present after drying (14)	moderately present after drying (15)
Tendency to splinter	absent	very little
Tendency to checking during drying	absent or controllable if present (16)	
Tendency to distortion during drying	absent or controllable if present (17)	
Blunting effect on cutting tools	slight to moderate, or severe if tipped cutters are used.	
Machining	good or satisfactory if tipped cutters are used and/or modified cutting angle	
Gluing	good	good, if necessary after pre-treatment or newly machined
Finishing	good	satisfactory; if necessary after pre-treatment or newly machined
Staining	good and even	satisfactory or controlable
Effect of wood substances on finishing	absent	controllable if present

Criteria for the selection of timber for the manufacture of flooring (strip flooring, block flooring, parquetry)

TIMBER PROPERTIES	PREFERABLE LEVELS	MINIMUM LEVELS
Density (18)	for pedestrian normal traffic (19): softwood: not less than 500 kg/m3 hardwood: not less than 600 kg/m3 for pedestrian heavy traffic (19): averaging not less than 675 kg/m3	
Grain (18)	straight or slightly interlocked	moderately interlocked (19)
Reaction wood	absent	no requirement
Shrinkage	small or medium (20)	large (21)
Tendency to exude gum or resin	absent after drying	limited after drying (22)
Tendency to corrode metals and staining in contact with metals	absent or controllable if present	
Staining neighbouring materials	usually not relevant	
Tendency to checking during drying	absent or controllable if present	
Tendency to distortion during drying	absent or controllable if present	
Blunting effect on cutting tools	slight to moderate, or severe if tipped cutters are used	
Machining	good, or satisfactory if tipped cutters are used and/or modified cutting angle	
Nailing	good, without preboring	satisfactory, without preboring or difficult (23)
Gluing	good	satisfactory or good after pre-treatment or newly machined
Finishing	good; after sanding a well-bonded and smooth coated surface must be obtainable by using an appropriate coating system	satisfactory; if necessary after pre-treatment or newly machined

Notes referring to the properties-criteria tables on the previous pages.

1 Classifications refer to the natural durability of the heartwood in ground contact, all sapwood is excluded. The latter should be treated as perishable and usually permeable to preservatives. The levels set for durability and preservative treatment generally assume some form of applied finish.

2 For information on measures and rules for the necessity on wood preserving bound by the different national regulations and on acceptable wood preservatives and suitable treatment schedules, specifications dealing in more detail with preservative treatment must be consulted in the consuming countries.

3 Acceptability depends on finish to be used and visual standard required. Exudation varies within timbers affected as to quantity and between timbers as to form (over boards generally or in isolated places). Resinous timbers cause premature failure of surface coating. Exterior wood staining is the most appropriate treatment in this instance. Resin exudation is likely to become visible, especially on south elevations.

4 Not included below 'Preferable Levels' because of risk in commercial practice of inadequate even drying throughout thick cross-sections; with strict application of correct drying techniques, performance will equal that of more rapidly drying timbers.

5 Painting and other finishing processes. For exterior use, timbers with a very coarse texture are the least satisfactory for painting and varnishing. Exterior wood staining is the most appropriate treatment in this instance.

6 Density is not critical, but it affects resistance to indentation and nail-holding properties. Softwoods and hardwoods of appreciably higher density will be correspondingly more resistant to indentation. If nail-holding is in question, in general the density of hardwoods should be higher than that of softwoods for comparable holding properties.

7 May be particularly troublesome in sawn timber less than 22 mm thick. Tendency to cupping across width has been included under "distortion", for this end-use. With timbers of good nail-holding properties and with fixings at frequent intervals, performance in situ may be satisfactory in thinner dimensions, but for the likelihood of air-dried timber not having been held long enough and resulting in unnecessary shrinkage or distortion in service.

8 Some of the timbers being 'Difficult' in nailing will accept small flooring nails if care is taken in application (e.g. Ipe). Many will be too hard, or split too easily or there may be neither practical experience nor information from standard tests. Since the nailing evaluation is based on 12-gauge nails applied perpendicular to the face, timbers marked as 'Difficult' should not necessarily be excluded for strip flooring or block flooring, but should not be specified without further evidence of suitability.

9 Painting and other finishing processes. For exterior use, timbers with a very coarse texture are the least satisfactory for painting and varnishing. Exterior wood staining is the most appropriate treatment in this instance.

10 Density is a general guide to strength and surface hardness. Reference should be made to remarks on the strength of timber in the introduction to this section where it will be seen that a particular level of density is 'Preferable' only as far as it contributes to, or necessary for, the strength of design as a whole.

11 An upper limit for density is not needed technically, but may be desirable when considering the effect of using very high density timbers on handling and transport of furniture, and bearing in mind that some timbers in this category may prove difficult to glue satisfactorily. For these reasons, timbers averaging over 950 kg/m^3 have been excluded. Some timbers in the lower density category, require careful selection so as to exclude pieces with visible evidence of brittleheart and those of exceptionally light weight (often an indication of this defect) since the strength of such pieces is appreciably below average and they are liable to sudden fracture.

12 While all recommendations assume adequate selection within the species, eliminating the wavy-grained material or that with grain running off the edge is particularly important for long rails, joints and sawn-curved back legs.

13 This is not a major disadvantage (e.g. Oak has considerable tangential shrinkage), but much movement in service can contribute to failure of weak joints or of those subject to racking action.

14 No resinous timbers can be guaranteed not to show exudation after manufacture and coating, but those in this category, if selected to exclude obviously troublesome pieces, are usually satisfactory. With some, however, a good deal of gumming of cutters and sticking together of uncoated stacked parts may occur.

15 When considering stuff-over framing, it should be borne in mind that in service exudation could be severe near a source of heat and cause staining through covers at any point where in contact with the wood. May be unsuitable for show-wood parts.

16 This is only applicable to show-wood. Care in drying can overcome this problem in most timbers, especially when they are more than 50 mm thick; but fine checking which does not show with light coatings may give trouble under dark stains or ebonising.

17 Some timbers with a severe tendency to distort have been used with apparent success but should not be used without considering the need for extra care in drying, the possibility of reject parts, and the realization that inadequately dried parts (especially long lengths) are likely to distort after manufacture.

18 Density relates to general strength, hardness and quantitative loss of surface. Grain relates to quantitative loss and smoothness. Low level of one can be partly compensated by high level of another.

19 Normal pedestrian traffic: less than 2000 persons a day, heavy pedestrian traffic: more than 2000 persons a day.

20 Timbers with heavily interlocked grain or typically irregular grain are not recommended for strip flooring in rooms with normal pedestrian traffic, but can be satisfactory for block flooring. Timbers with heavily interlocked grain or irregular grain may be successfully applied for heavy pedestrian traffic.

21 For strip flooring particularly, those timbers which, meeting all other requirements have the smallest difference between radial and tangential shrinkage and small movement, are preferable. Small shrinkage only, if under-floor heating is used.

22 Where minimum humidity fluctuation is anticipated, timbers which, meeting all other requirements, are in the 'Large' shrinkage category (e.g. Jarrah, Keruing) may be satisfactory; but should not be specified without ensuring (1) that conditions will be suitable, (2) that adequate allowance is made for some cumulative movement of the floor and (3) that the timber is dried to, and retained at, a moisture content equal to average in-service conditions before, during and after installation.

23 Not suitable for very warm situations - nor with certain applied coating systems.

24 Some of the timbers being 'Difficult' in nailing will accept small flooring nails if care is taken in application (e.g. Ipe). Many will be too hard, or split too easily or there may be neither practical experience nor information from standard tests. Since the nailing evaluation is based on 12-gauge nails applied perpendicular to the face, timbers marked as 'Difficult' should not necessarily be excluded for strip flooring or block flooring, but should not be specified without further evidence of suitability.

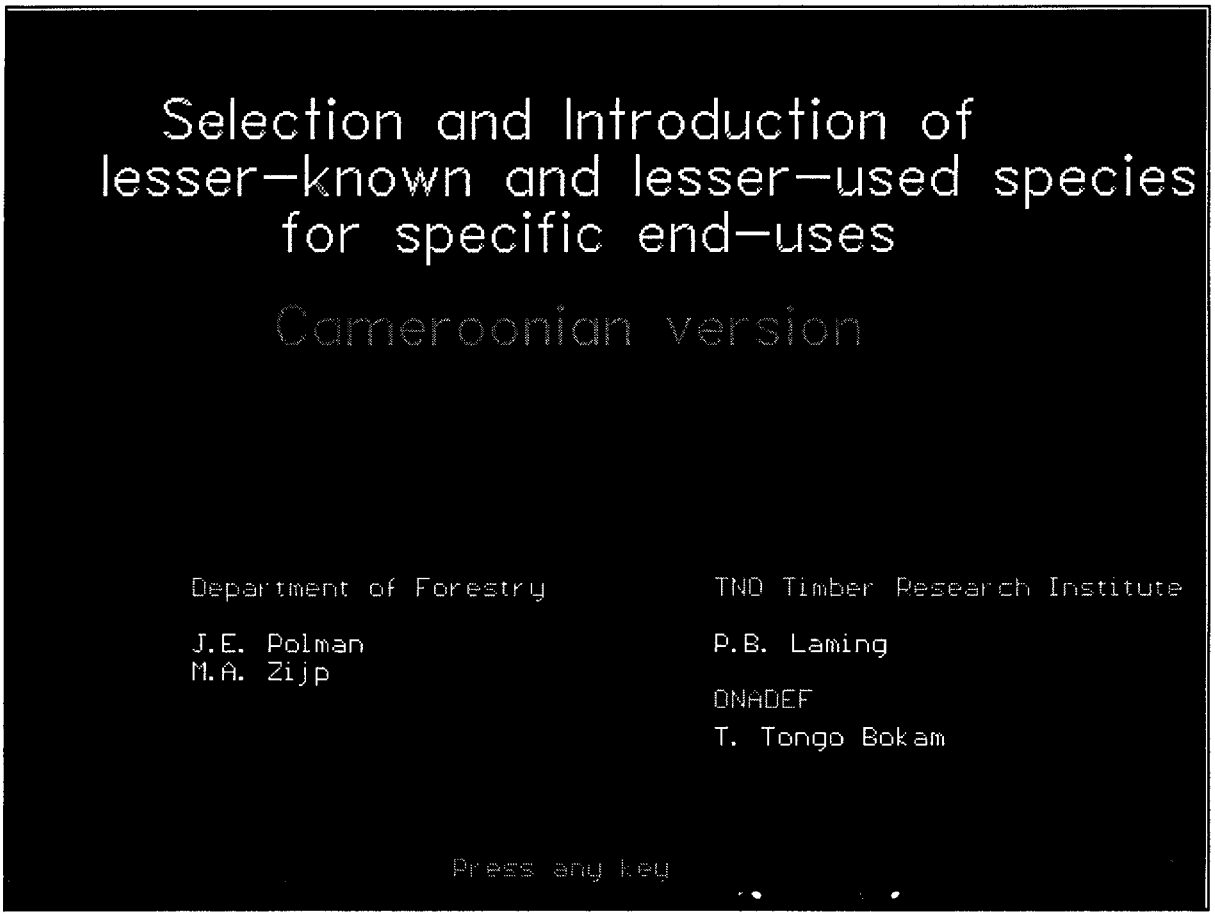
REFERENCE GUIDE

The possible menu choices will be explained in detail in this section. Some information on printing, memory problems, file descriptions and possible errors will also be given.

Menus

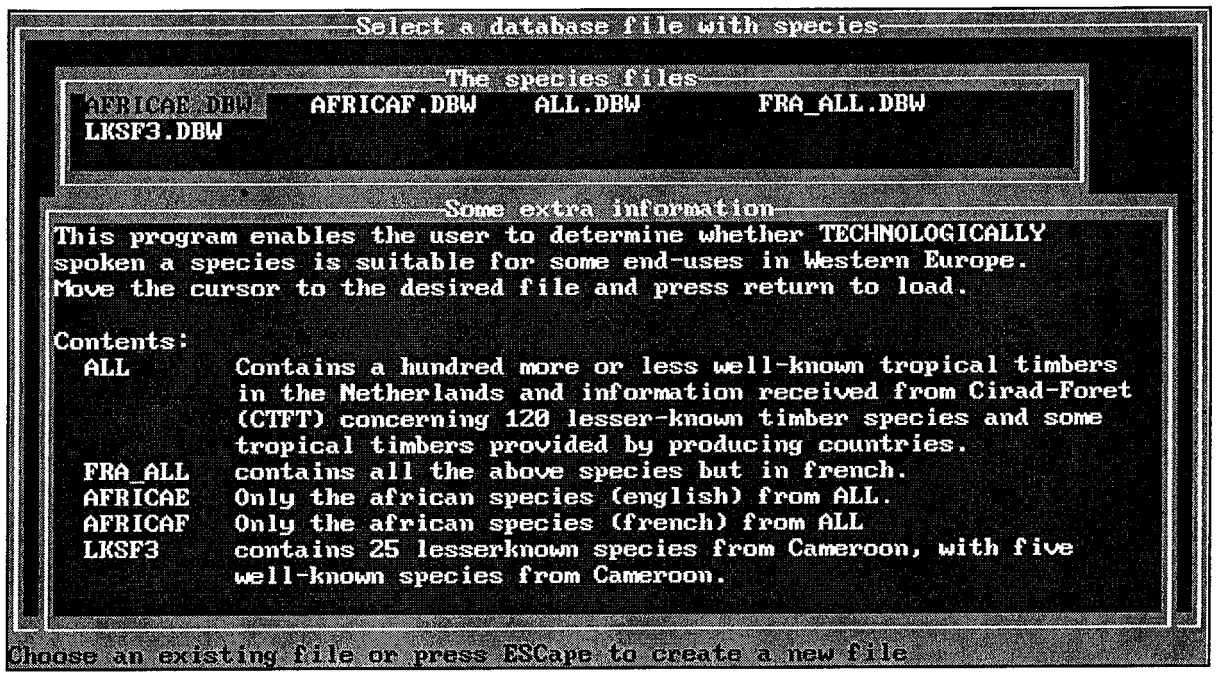
All possible menus that can be used by the programme, will be shown.
For more information and the various menu types and keys, please consult the chapter "menu system" of the user's guide.

1 The opening screen



When starting the programme, an opening screen will be displayed. The programme will proceed if you press a key (SHIFT, CAPSLOCK, CTRL, ALT, PAUSE, however, have no effect). Which screen appears depends on the hardware (graphical card and/or monochrome monitor) and the selected language.

2 The "pick a database file"- menu


Select a database file with species
The species files
AFRICAE.DBW AFRICAF.DBW ALL.DBW FRA_ALL.DBW
LKSF3.DBW
Some extra information
This program enables the user to determine whether TECHNOLOGICALLY
spoken a species is suitable for some end-uses in Western Europe.
Move the cursor to the desired file and press return to load.
Contents:
ALL Contains a hundred more or less well-known tropical timbers
in the Netherlands and information received from Cirad-Foret
(CTFT) concerning 120 lesser-known timber species and some
tropical timbers provided by producing countries.
FRA_ALL contains all the above species but in french.
AFRICAE Only the african species (english) from ALL.
AFRICAF Only the african species (french) from ALL
LKSF3 contains 25 lesserknown species from Cameroon, with five
well-known species from Cameroon.
Choose an existing file or press ESCape to create a new file

It is possible to load a number of species in the programme. Choose an existing file or press ESCape to create a new file.
You can make a choice by moving the highlighted (or coloured) bar to the one you want to load by using the arrow keys. When ready, press the RETURN key. The programme will load the selected file in memory.

If you want to create a new database file, press ESC. The programme will prompt you for a file name. Up to eight characters are permitted for this name. You should not add an extension as the extension (DBW) will be added automatically.

If you want to load a species file by default:
This is possible when you start the programme MORELKS with a command qualifier.

```
MORELKS FN
```

(For example, if you want to load the file ALL, you can type

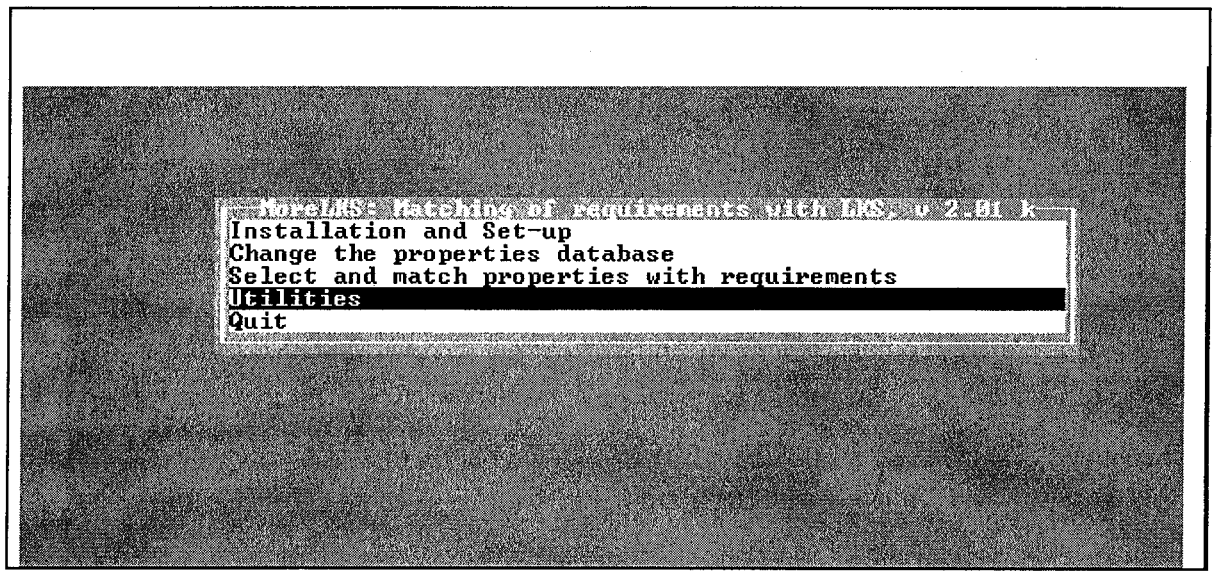
```
MORELKS all
```

and you will not be prompted to select a file.)

3 The main menu

After a database file has been loaded, the main menu appears.

- "Installation and set-up" offers the opportunity to switch between text mode and graphical mode and to change colours in menus and windows (see menu 5). Here you can also set the default language.
- "Change the properties database" offers the possibility to view, change, delete and add species in the current active database (see menu 6).
- "Select and match properties with requirements" provides the possibility to


MoreLKS: Matching of requirements with LKS, v 2.01 k
Installation and Set-up
Change the properties database
Select and match properties with requirements
Utilities
Quit

screen species for selected end-uses (see menu 7).

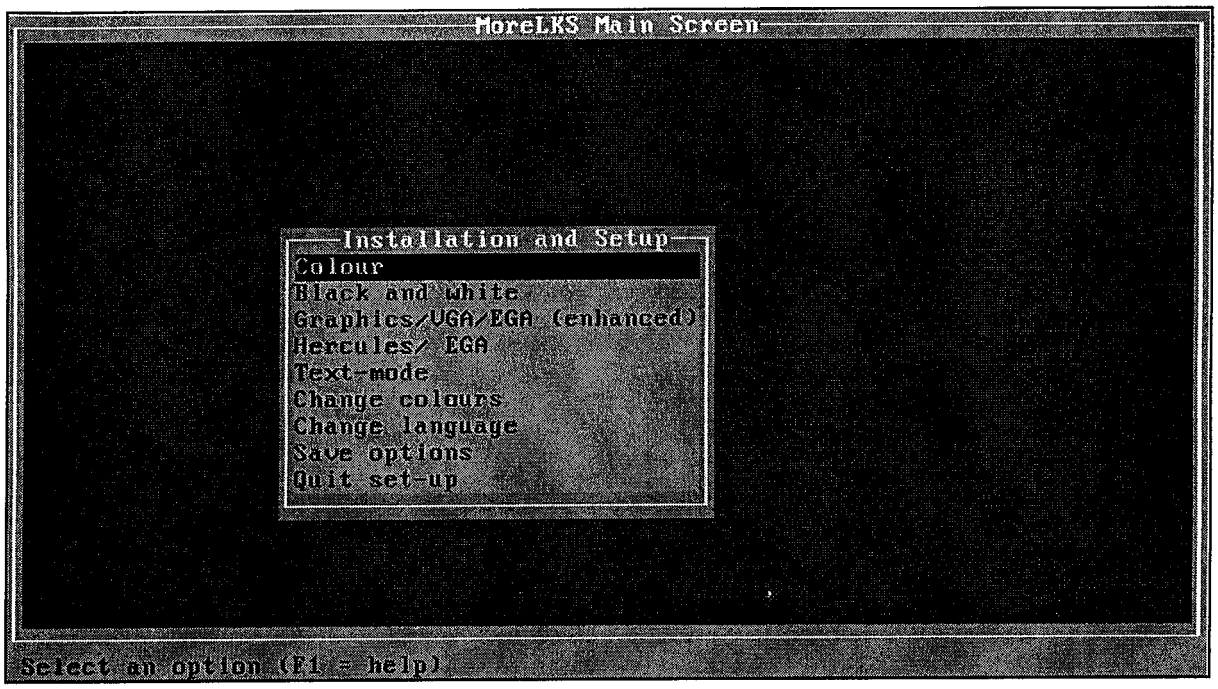
- Utilities". Using this option you can copy files to your floppy disk (see menu 8).
- "Quit". You will leave the programme (after verification).

4 Getting help

Besides this manual, help is available from the programme in most cases. It is also possible in most cases to get context sensitive help.

For more information on the help system and how to use it, please consult the help system part in the user's guide.

5 Installation and set-up

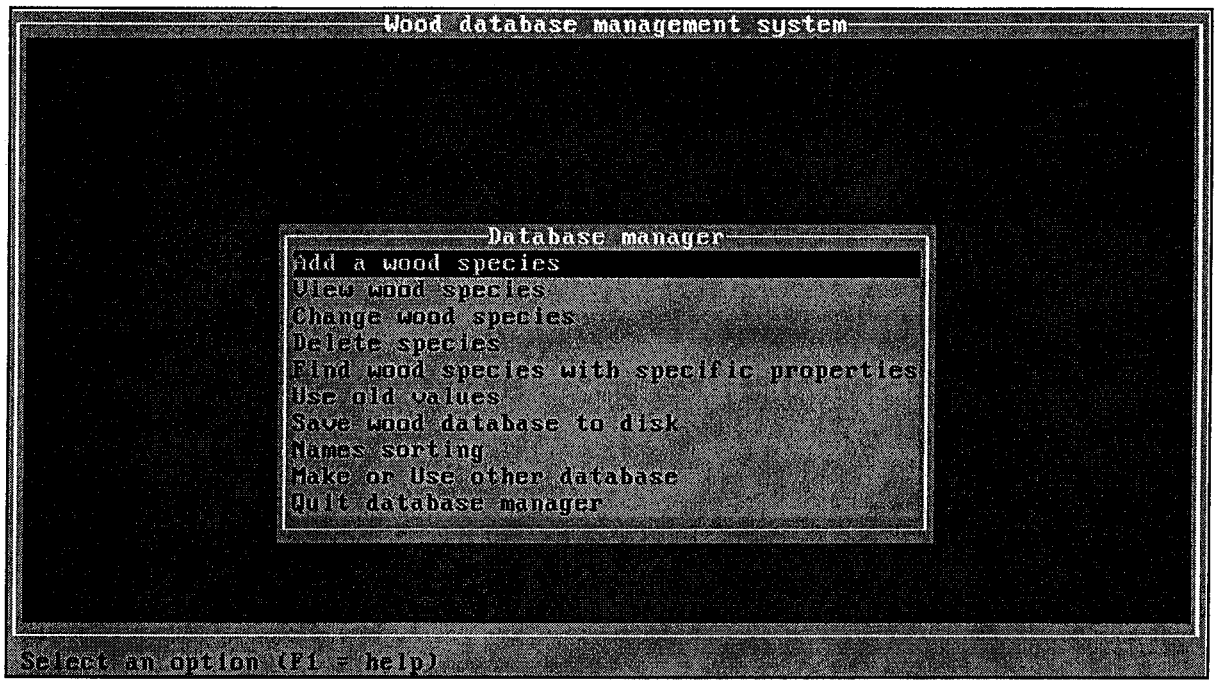


The set-up of the programme can be changed and saved using this option. Here are the choices:

- "Colour": You can select this option if your screen has the capability of displaying colours.
- "Black and white": you can select this option if the display of the matching is poorly visible (or not at all).
- "Graphics/VGA/EGA (enhanced)": this will select the graphic option. The programme displays the matching graphical.
- "Hercules/Ega": this will select the graphic option for Hercules graphical cards. Matching will be displayed using 720*350 pixels (horizontal and vertical dots).
- "Text-mode": the programme will continue to use the 25 lines 80 columns and not switch to graphic display during the matching.
- "Change colours": you can change the colours of the windows on the screen, the menu, and more (see menu 9).
- "Change language": you can change the language of the programme, currently French and English.
- "Save options": the settings currently being used will be saved on disk. So, use this option to start the programme next time with the selected colours and language.
- "Quit": leave this menu and return to the previous one (main menu).

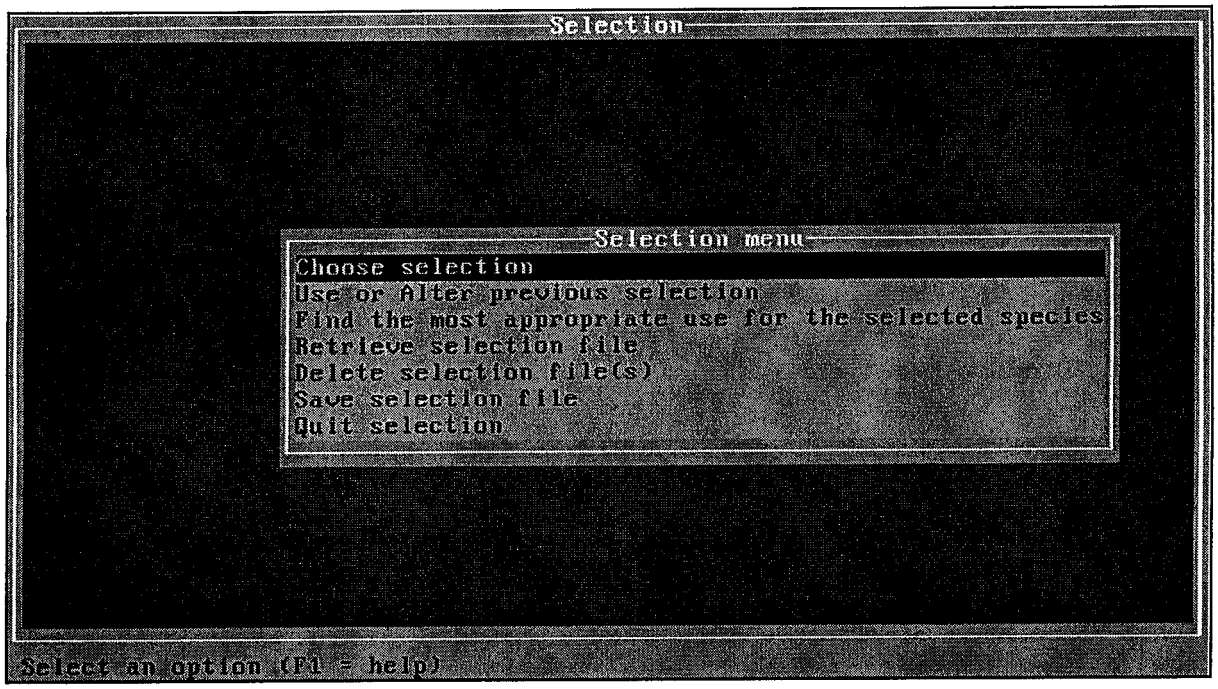
6 Change the properties database

With this menu, operations on the properties of species can be performed.



- "Add wood species". A form will appear (see menu 13). After completing this form successfully, the species will be added to the internal database (sorted) and saved on disk.
- "View wood species". The species, loaded in memory, can be viewed using this option. Selection of the species to be viewed will be done by displaying the list of species (see menu 11: select the species). Changing the properties is not possible with this option.
- "Change wood species". This operates in the same way as the previous option. However, changes can be made in the names, properties and other items of the selected species, as long as they do not concern the original database files provided.
- "Delete wood species". After having selected the species (using menu 11) to be deleted they will be deleted after verification. The species will be completely removed from memory and file.
- "Find wood species with specific properties". This option can be used to search the database for species meeting specific requirements (see menu 16).
- "Use old values". The information of the last display operation (add, view, or change) of a species will be displayed on a new form and can be used to add species to the database without typing duplicate information.
- "Save wood database on disk". The current wood database can be saved on hard disk (or floppy disk if you started the programme from a floppy disk). After adding, deleting and changing a species, this will be done automatically.
- "Make or Use another database". You can choose a database other than the one selected at the start of the programme. See menu 2:"Pick a database file with species for details".
- "Quit database manager". Leave this menu and return to the main menu).

7 Select and match properties with requirements



With this menu, one can select the species one wants to screen and other related actions.

- The "Choose selection" option allows one to choose from the total list of species (see menu 11) with nothing pre-marked.
- The "Use or alter previous selection" option allows you to choose from the total list of species (see menu 11) with the previous selection(s) pre-marked.

Having selected the species, you can select the end-uses (see menu 12). The screening process will then start (see menu 14).

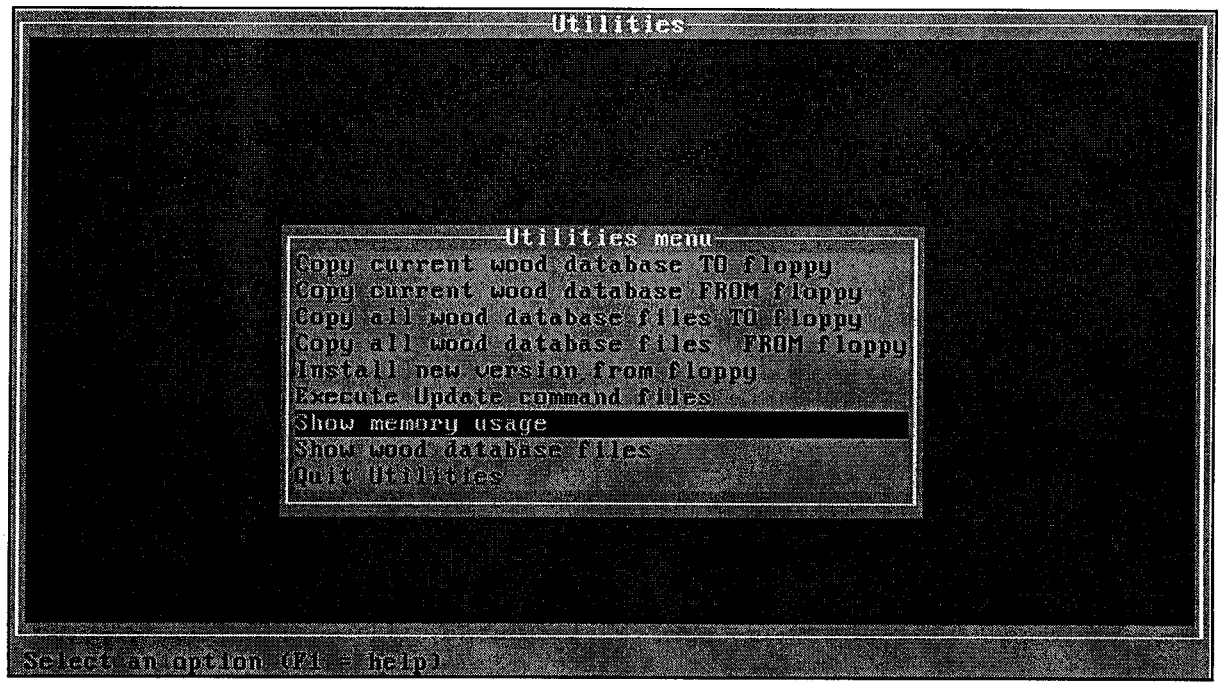
- The "Find the most appropriate use for the selected species"-option will process the marked species (by option one, two or four of this menu). The programme will search and screen the end-use(s). The best rating (defined as the practical evaluation) will be displayed. NOTE: Only western European end-uses are in effect. Other defined end-uses do not contain information to arrive at a practical evaluation.
- The "Retrieve selection file" option allows you to load an older selection[1] (previously saved) from disk (see menu 15). You can use this selection if you select the "Use or alter previous selection" option.
- "Delete selection file(s)": the available selection files will be listed. Using the cursor you can select a selection file to be deleted. The file will be deleted after verification.

---

[1] The selected species must at this time be present in the selected database file.

- "Save selection file": the marks of the selected species (as a result of option one or two) will be saved on disk for future retrieval. You will be prompted to provide a name. It will be saved with the extension SEL, after successfully entering the name.

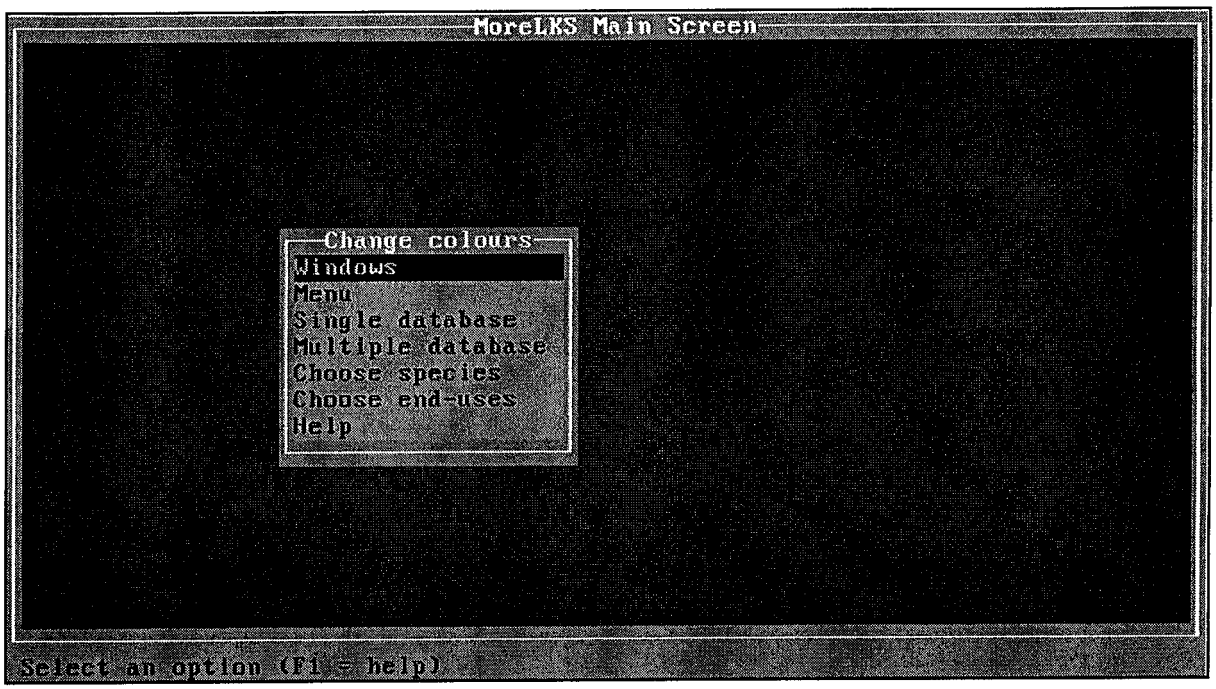
8 Utilities


Utilities
Utilities menu
Copy current wood database TO floppy
Copy current wood database FROM floppy
Copy all wood database files TO floppy
Copy all wood database files FROM floppy
Install new version from floppy
Execute Update command files
Show memory usage
Show wood database files
Quit Utilities
Select an option (F1 = help)

This menu makes it simple to store the database files on a floppy disk. It can also be helpful in updating the programme to a newer version.

- "Copy current wood database file to floppy"- will copy the internal database file from the default drive to the floppy disk inserted in drive A.
- "Copy current wood database file from floppy"- will copy the internal database file from the floppy disk inserted in drive A to the default directory.
- "Copy all wood database files to floppy"- will copy all the files with extension DBW (and some others) from the inserted floppy in drive A to the default directory.
- "Copy all wood database files from floppy"- the reverse of the previous option: it will copy all the files with extension DBW (and some others) from the inserted floppy in drive A to the default directory.
- "Install new version from floppy". This option cannot be used unless stated in a newer version of the programme.
- "Execute update command files". This option cannot be used unless stated in a newer version of the programme.
- "Show free memory". The amount of free available internal memory will be displayed.
- "Show wood database files": gives a list of the wood database files in the default directory.
- "Quit utilities" will leave this menu and return to the previous one (the main menu).

9 Change colours



You can change the colours (see menu 10) of the items mentioned in the menu:

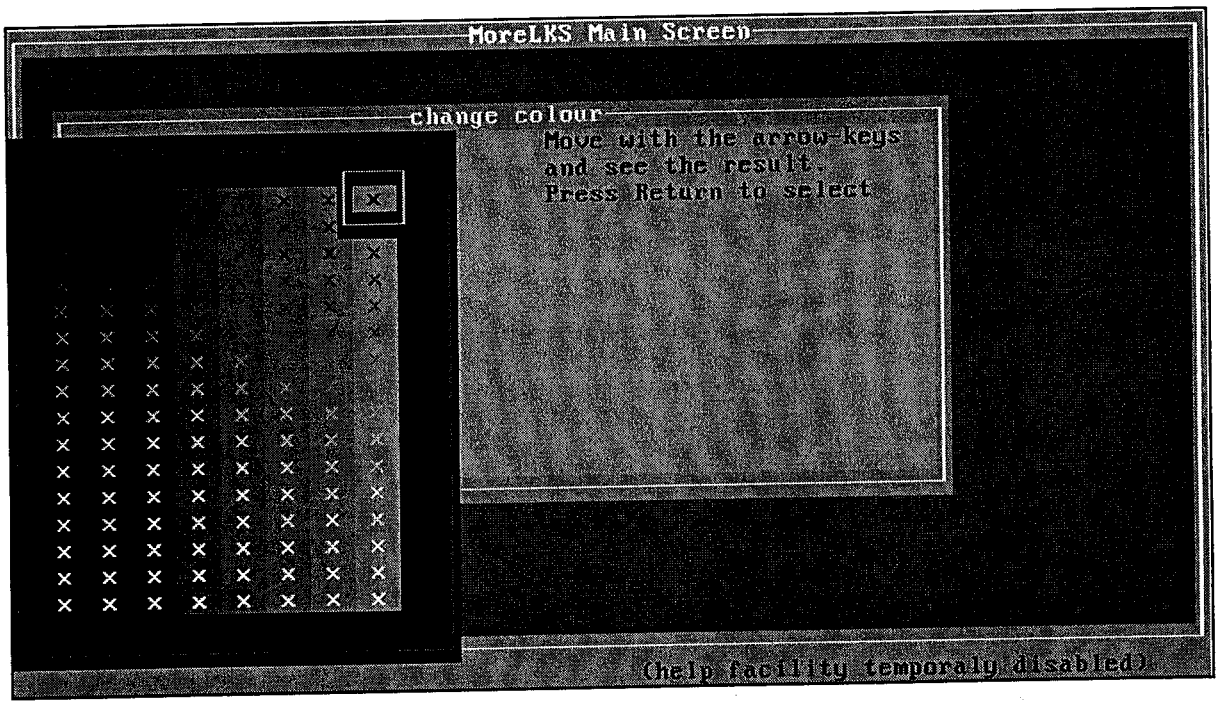
- "Windows": the screen background on which for instance the text and the menu are displayed.
- "Menu": the screen colour of several menus in the programme.
- "Single database": all single menus to fill in the properties in the properties form.
- "Multiple database": All the multiple menus to fill in the properties in the properties form (grain and region).
- "Choose species": the menu colours of menu 11.
- "Choose end-uses": the menu colours of menu 12.
- "Help": the colours of the helptext to be displayed. On certain laptops, the original colours do not provide a contrast between background and text colour.

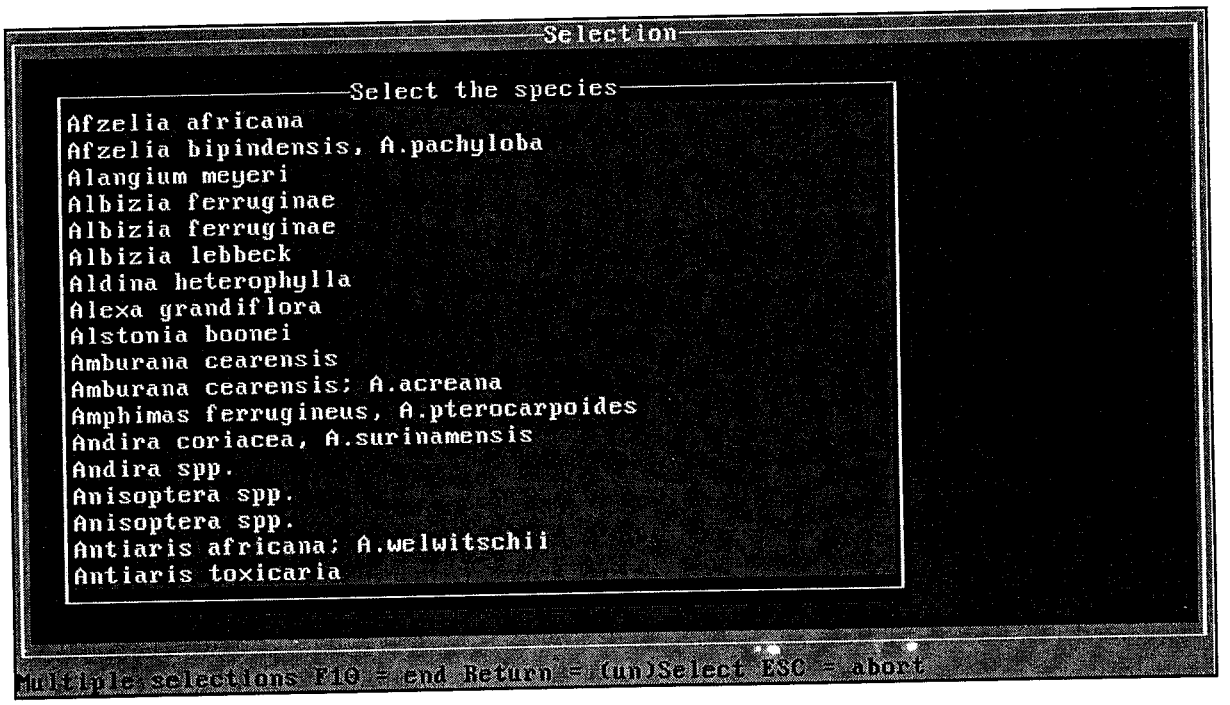
10 Change colour

After selecting an item in the previous menu, you may choose the colour selection by moving the ARROW and pressing RETURN. First you will be prompted to choose the colour for the background and text, and then the colour for the frame surrounding the selected item.

11 Select the species

Press RETURN to switch between selected and not selected. This will affect the species which is coloured or highlighted by the cursor bar. If you want to find the botanical name for a commercial or trade name, press F5. After entering the name (or a part of it) the corresponding botanical name will be displayed, if it is present in the current database file.

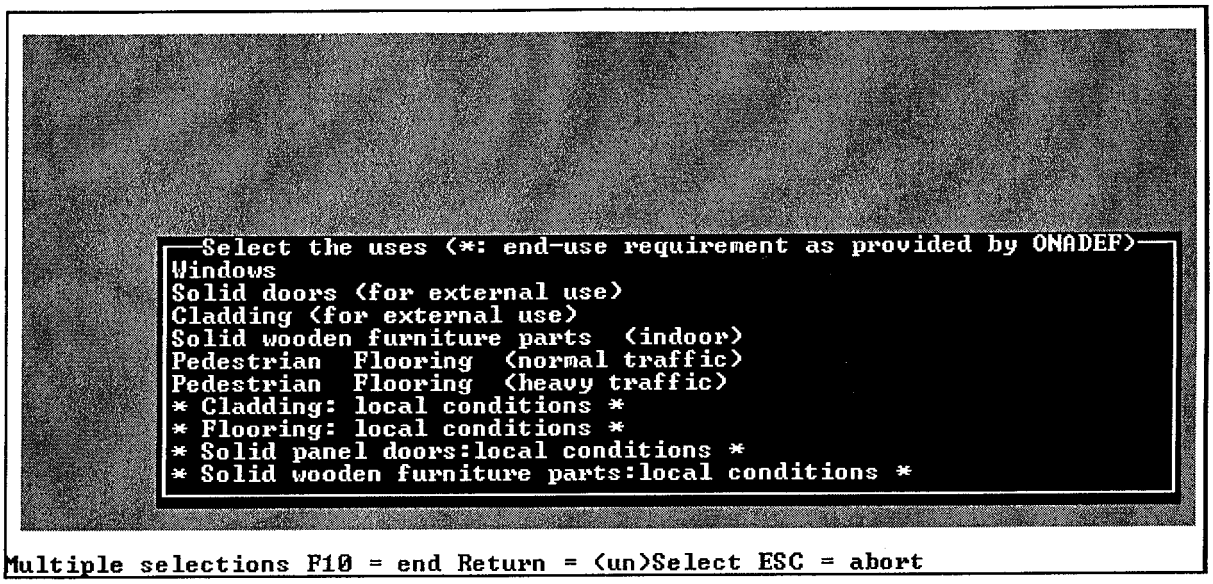




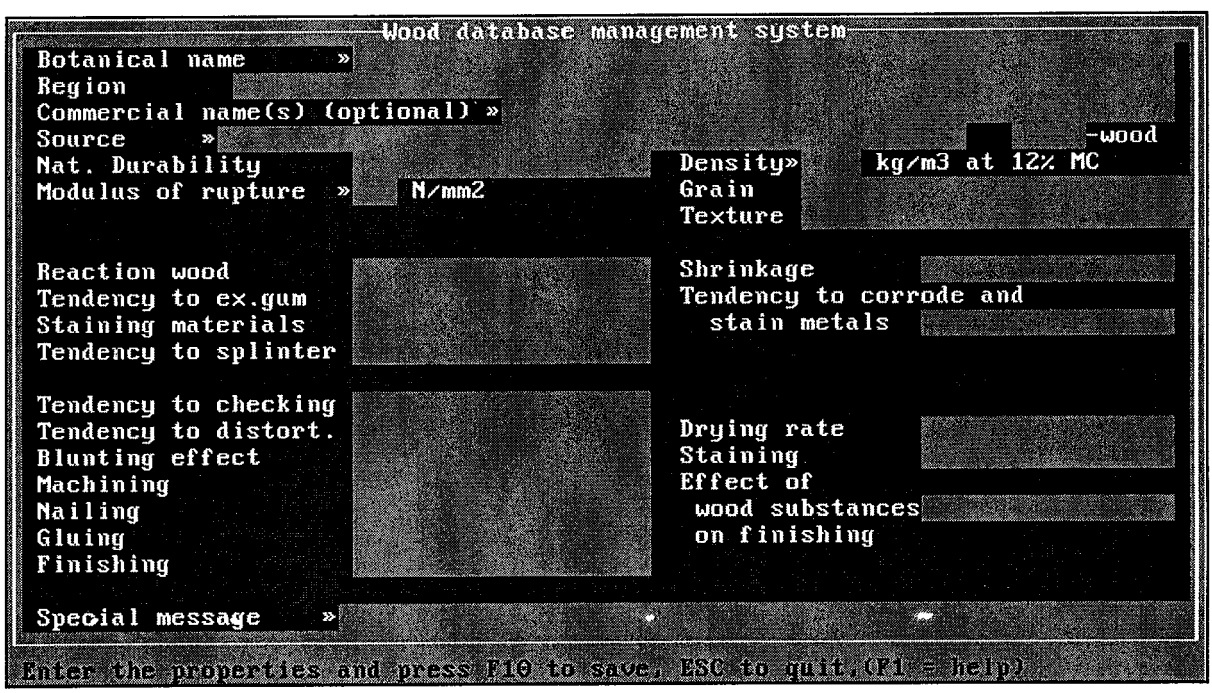
Press ENTER to select the next species: useful for selecting a large number of adjacent species.

12 Select the end-uses

Press RETURN to switch between selected and not selected. This will affect the end-use which is coloured or highlighted by the cursor bar. Press ENTER to select the next end-use: useful for selecting a large number of adjacent end-uses.

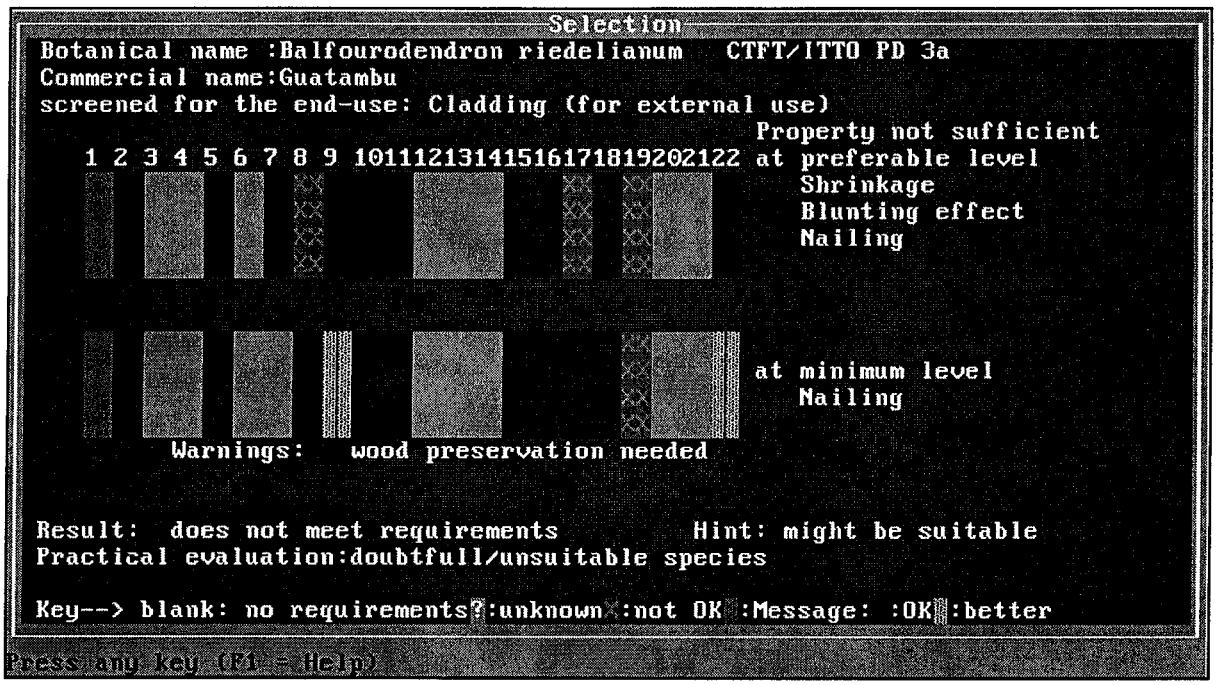

Select the uses (*: end-use requirement as provided by ONADEF)
Windows
Solid doors (for external use)
Cladding (for external use)
Solid wooden furniture parts (indoor)
Pedestrian Flooring (normal traffic)
Pedestrian Flooring (heavy traffic)
* Cladding: local conditions *
* Flooring: local conditions *
* Solid panel doors:local conditions *
* Solid wooden furniture parts:local conditions *
Multiple selections F10 = end Return = (un)Select ESC = abort

13 Properties form



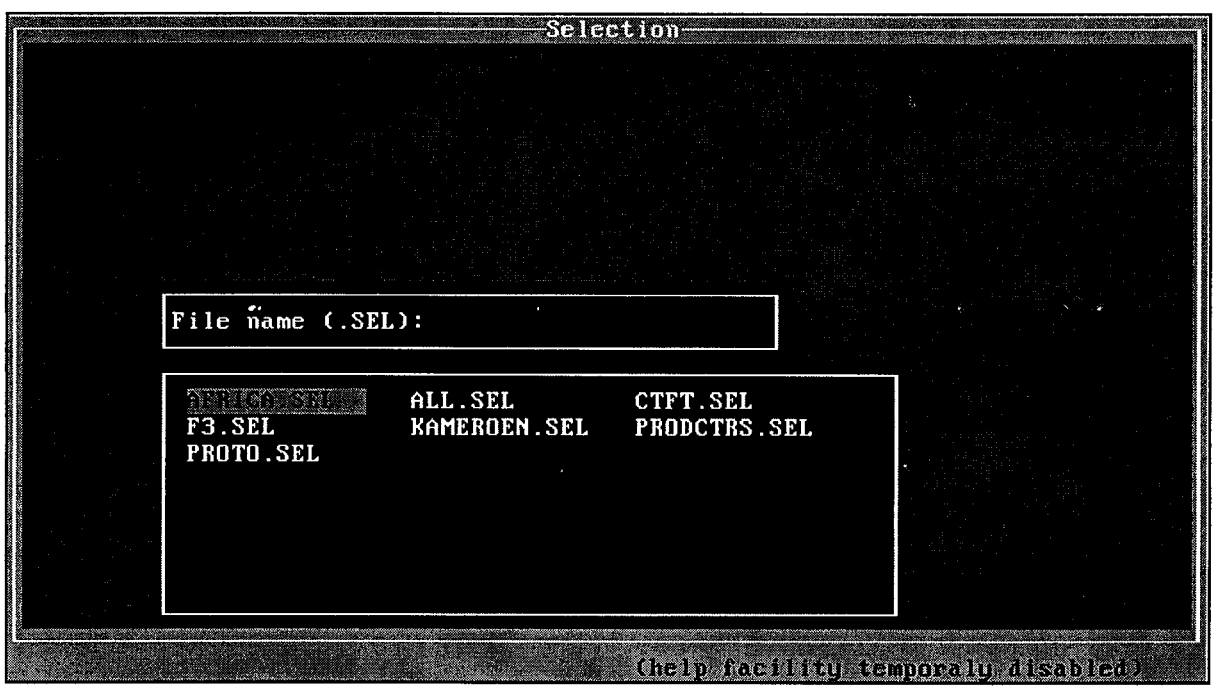
The form displays the various properties which have to be filled in (except the commercial name, source and message).
Pressing ESC will leave the form without change for the displayed species. F10 will save the information if all required data haver been entered and the displayed species is not from the original database. To fill in a field, use the ARROW to go to that field and press RETURN to get a list of choices, except Modulus of rupture and Density that require digits.

14 Screening the species


Selection
Botanical name :Balfourodendron riedelianum CTFT/ITTO PD 3a
Commercial name:Guatambu
screened for the end-use: Cladding (for external use)
Property not sufficient
1 2 3 4 5 6 7 8 9 10111213141516171819202122 at preferable level
Shrinkage
Blunting effect
Nailing
at minimum level
Nailing
Warnings: wood preservation needed
Result: does not meet requirements Hint: might be suitable
Practical evaluation:doubtfull/unsuitable species
Key--> blank: no requirements?:unknown :not OK :Message: :OK :better
Press any key (F1 = Help)

For an explanation please refer to the appropriate section in the user's guide. Pressing ESC will bring you back to the "Select and match properties with requirements" menu.

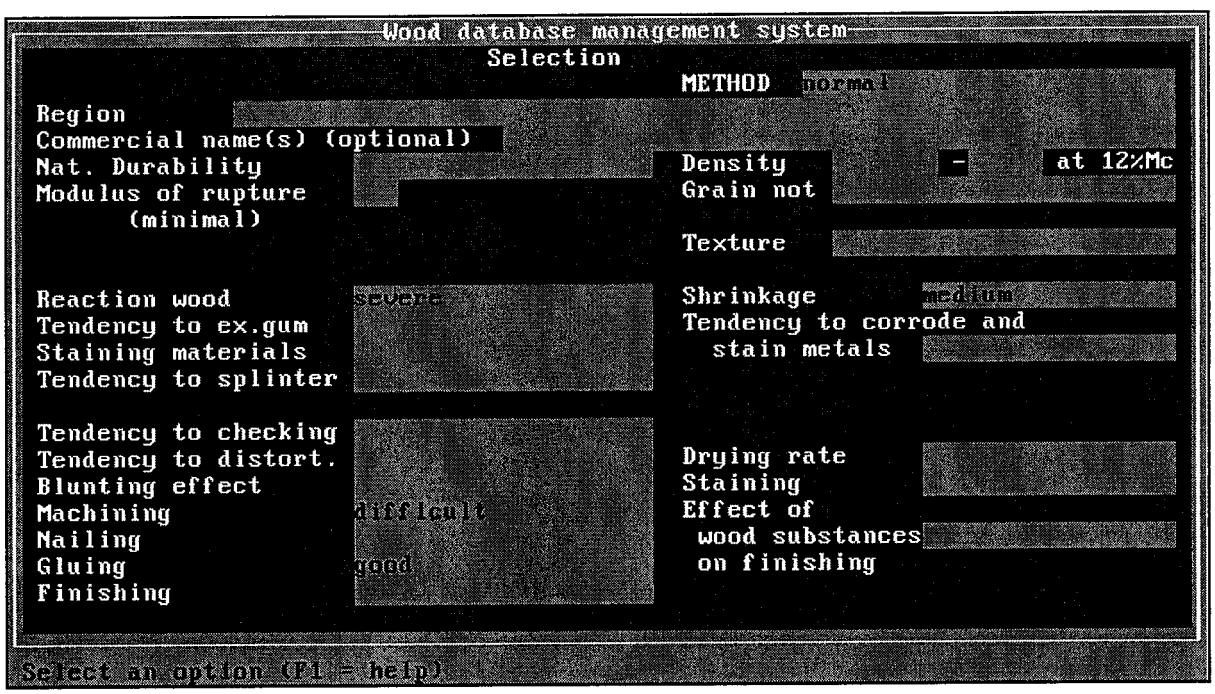
15 Selection files



First enter a name to retrieve a selection-file.
You may also press RETURN to get a list of available selection files to choose from (by moving the cursor bar to the desired selection file with the ARROW keys and pressing RETURN). The previously selected species will be omitted. An error will occur if the selected species are not present in the internal database. If this happens, you should load the appropriate database file in memory (so, go back to the Main menu, select the "Change the properties database" followed by "Make or Use another database").

16 Finding species meeting with specific properties

To find species with specific properties this form can be used. The method (possible option "Normal" or "Fixed") will determine the search process. When "Normal" is selected, and - for example - the natural durability class "moderately durable" is selected, the search will accept all species which are moderately durable or better (more durable). "Fixed" will only search for moderately durable timbers.



PRINTING

In the present version of this programme, emphasis is on displaying information on the screen. However, printing is possible but is not extended.
If you want to print the screening of a species for an end-use, this can be done by pressing PRINT SCREEN (if this does not work, try pressing SHIFT and PRINT SCREEN simultaneously).
If your printer produces output which does not fulfil your expectations:

- → Go to the Installation and Set-up option in the main window and select textmode.
- → Return to the matching section and try again.

It is also possible to get information directly printed. This is option 3 of the selection and matching menu: Find the best use for the selected species. To do this, press ALT P and select the appropriate option on (to printer and/or to log file). If you set "LOG File" to "on" then the information will be saved in a file named PROLOG.LOG. This ASCII text file can be printed later using the DOS command PRINT or can be imported into a word processor for formatting and printing.

Files and their description

The following files are present on the floppy disk(s).

Name	Extension	Function
MORELKS	EXE	The main programme
MENUCH3	FRA/ENG	Programme file (menu choices, status bar, language elements)
SETSCR1	SET	contains screen positions for VGA.
SETSCR2	SET	contains screen positions for Hercules e.a.
SETUPB	SET*	contains colour selections (for black and white).
SETUPC	SET*	contains colour selections.
ENG_HLP	DEF	Data definitions for the HELP system (in English).
FRA_HLP	DEF	Data definitions for the HELP system (in French).
ENG_HLP	HLP	Data for the HELP system in English.
FRA_HLP	HLP	Data for the HELP system in French.
ENG_OPN	HLP	Start-up explanation (in English).
FRA_OPN	HLP	Start-up explanation (in French).
ATT	BGI	Driver for ATT-400-line Graphics adapter.
CGA	BGI	Driver for Color Graphics Adapter.
EGAVGA	BGI	Driver for Enhanced Graphics Adapter and Video Grapics Adapter.
HERC	BGI	Driver for Hercules Graphics Adapter.
IBM8514	BGI	Driver for IBM8514 Graphics Adapter.
PC3270	BGI	Driver for 3270-PC Graphics Adapter.
SANS	CHR	Stroked font definition.
LITT	CHR	Stroked font definition.
SETTING	DBA	The saved configuration (language, colour).
PROPVAL2	DBA	Files for the programme.
WOOD13	SCR	Definitions for screen handler.
DATVAR2	DBA	Numbers of variables.
NRSYM2	ENG/FRA	Text strings.
ENG_WEU	DBU	Definition of end-use requirements (English text).
FRA_WEU	DBU	Definition of end-use requirements (French text).
ALL	DBW**	100 well-known tropical timbers, 50 lesser-known species. submitted by producing countries, 120 lesser-known species. from former CTFT (now Cirad Forêt) from France (in English).
FRA_ALL	DBW**	ALL (see above) but in French.
AFRICAE	DBW**	Only the African species from ALL.
AFRICAF	DBW**	Only the African species from FRA_ALL.
LKSF3	DBW**	The species added during the F3 project.
DEMO	SEL*	A number of selected species.
PROTO	SEL*	A number of selected species.
ALL	SEL*	A number of selected species.
AFRICA	SEL*	A number of selected species.
INSTALL	BAT	Batch file for installation.
MLKS	BAT	Batch file for installation.

The files marked with * can be modified by the user. In the present version of the programme, changes can be made by adding timber species in a file with the extension DBW (marked **). You can remove and add species. Changes can be made but only with species you added to the database.

You can also make, change or delete SEL files.
The preferred colours and other settings can be changed in the "installation and set-up" menu.

Error-messages
These are a number of error messages that may occur.

1000 The arguments in 'makewindow' are illegal.
Check that
- the window number is in the range 1 .. 127
- StartRow + NoOfRows < = no. of rows on screen (usually 25 or 43)
- StartCol + NoOfCols < = no. of cols on screen (usually 80 or 120)

1001 The cursor values are illegal.
The Row and Column must be inside the actual window.

1002 Stack overflow.

1003 Heap overflow. Not enough memory.

1007 Heap overflow. Not enough memory.

1008 Arithmetic overflow in integer operation. The result cannot be stored in a 16-bit integer, which has a range of -32768 .. 32767.

1012 Attempt to assign output device to a file that is not in write mode.

1013 Failure in 'system' call.
'system' tried to load a programme too large for the available memory space, or which remained resident.

1014 Division by zero.

1015 Illegal window number An attempt to refer to a non-existing window was made.

1016 Maximum number of windows exceeded (The maximum is 34).

1018 The file isn't open.

1024 Error executing external programme. The external programme might be too large to be executed from the system or it could be an illegal EXE-file. Try to execute the external programme from the DOS shell to see what happens.

1027 Impossible to open file.

1028 Impossible to write file.

1030 Disk I/O error.

1031 Overflow in Expanded Memory System.

1071 File is not in read mode, or it is closed.

1072 Impossible to delete file.

1073 Impossible to rename file.

1074 Invalid arguments to the 'date'-predicate.
The arguments should be three integers in the order day, month, year.

1101 Integer expected (during term reading).

1103 Double quote expected (during term reading)

1104 Single quote expected (during term reading).

1105 List start expected (during term reading).

1106 End of list expected (during term reading).

1107 Functor not found in domain (during term reading).

1108 '(' expected (during term reading).

1109 ',' or ')' expected (during term reading).

2000 Not enough storage space for the text.

2001 Cannot execute a write operation.
It is difficult to establish the exact reason for this error, but more often than not it is caused by a full disk or an invalidated floppy drive. This latter condition may occur if several attempts have been made to write to a drive with no disk.

2002 Impossible to open :
The specified file does not exist or cannot be created.

2003 Impossible to erase : The specified file does not exist.

2004 Illegal disk : Illegal device or path.

2006 Cannot execute a read operation.
2007 Cannot execute a write operation to log file: This may be caused by the disk being full. The log file has been closed.
2009 Illegal path.
2010 Graphics equipment on this machine does not support the specified mode.
2011 Impossible to execute 'system'-predicate.
5100 The predicate is not supported in graphics mode.
5102 The hardware does not support the specified text mode.
6000 BGI graphics not installed.
6001 Graphics hardware not detected.
6002 Device driver file not found.
6003 Invalid device driver file.
6004 Not enough memory to load driver.
6005 Out of memory in scan fill.
6006 Out of memory in flood fill.
6007 Font file not found.
6008 Not enough memory to load font.
6009 Invalid graphics mode for selected driver.
6010 Graphics error.
6011 Graphics I/O error.
6012 Invalid font file.
6013 Invalid font number.
6014 Invalid device number.

Memory problem
The programme uses the internal memory of your computer. If the memory required is less than that available in your computer, an error will occur. It can occur as the programme is starting up. After the command to start the programme has been given it will give :

programme too big for memory
(or an equivalent phrase if another language was selected)

Also, it is possible that after the programme has been loaded in memory a problem will occur when loading some starting information. The programme will issue an error message and return to the operating system (DOS).

Also, when loading a data file with species it is possible that this may not fit in the memory.

If such a problem occurs, try the following options:

- Start the computer again but do not use memory resident programs.
- If memory problems start after selecting a species file: do not select the largest file (ALL or FRA_ALL) but try a smaller one. If the programme still gives a memory error: create a new file and check the memory. This can be done by choosing the "Utilities" option and the "Memory" option. The number displayed after "heap" should be above 50000 to load a hundred species.

In the other cases:

The programme requires computers with, preferably, a 640 Kb internal memory. With some drawbacks it is possible to use 512 Kb. If you have a computer with only 256 Kb then the programme will not work. Try to install more memory or use this programme on another (newer) computer.

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INDEX

Acceptance 13
Add a wood species 36
ALT P 44
Back-up 16
Batch file 16
CGA 16
Change
  colour 39
  colours 39
Change the properties database 35
Change wood species 36
Choose selection 37
Colours 16, 24, 35
Computer 11
Copy 24, 38
Delete selection file 37
Delete wood species 36
Display 16
EGA 16
End-use 26
Error messages 46
Evaluation 14
F1 17
Floppy disk 38
Getting help 34
Graphic 24
Heap 46
Help 17, 34
Hercules 16
Hint 13, 22
Install 16
Installation and set-up
  menu 35
Internal memory 48
Key 13, 21
Keyboard 7
Keys 7
Laptops 24
Main menu 33
Make or Use other database 36
Meets requirements 13
Memory 11
Menu 33
  change the properties database 35
  Installation and setup 35
  main 33
  pick a database file 33
Menus. 18

Minimum 13
MS-DOS 11
New version 24
Number 22
Opening 32
Opening screen 32
Pattern-filled 13, 21
PC-DOS 11
Pick a database file 33
Practical evaluation 13
Pre-marked 21, 37
Preferable 13
PRINT
  SCREEN 44
Printer 23
PROLOG.LOG 44
Properties 25
  technological 25
Properties form 41
Property 22
PS/2 11
RAM 11
Range 23
Requirements
  end-use 26
Result 22
Retrieve selection file 37
Save selection file 38
Save wood database to disk 36
Screen 32
Sections 7
Select the end-uses 40
Select the species 39
Selection 21
Selection files 42
Set-up 24
Settings 16
Show memory usage 38
Sound 23
Special characters 19
Special Wood Characteristics 25
Species
  add 36
  change 36
  delete 36
  view 36
Suitability 13, 21
Technological Properties 25
Text 24
True compatible 11

Uppercase 7
Use old values 36
Use or alter previous selection 37
Version 24
VGA 16
View wood species 36
Windows 11
Wood Characteristics
general 25
special 25

APPENDIX A

Classification of properties and grades

Here the various properties used in the MoreLKS programme are listed with the grades used in the properties of species and/or end-use requirements.

1 Natural durability

- unknown
- perishable (class 5)
- perishable - non-durable (class 5/4)
- non-durable (class 4)
- non-durable - moderately durable (class 4/3)
- moderately durable (class 3)
- moderately durable - durable (class 3/2)
- durable (class 2)
- durable - very durable (class 2/1)
- very durable (class 1)

2 Density low

Density requires a number. In end-uses applies:

- very light < 300 kg/m^3
- light 300 - 450 kg/m^3
- medium light 450 - 650 kg/m^3
- moderately heavy 650 - 800 kg/m^3
- heavy 800 -1000 kg/m^3
- very heavy >1000 kg/m^3

3 Density high

This is for species a copy of the density but in an end-use the maximum allowed density.

4 Modulus of rupture

This requires a number.

5 Grain

- unknown
- spiral
- wavy
- heavily interlocked
- moderately interlocked
- slightly interlocked
- straight

(a combination of the above mentioned is possible)

6 Texture

6 Texture

- unknown
- coarse
- moderately coarse
- moderately fine
- fine

7 Reaction wood

- unknown
- severe
- medium
- slight
- absent

8 Shrinkage

- unknown
- large
- medium
- small

9 Tendency to exude gum/resin

- unknown
- very serious
- serious
- moderate
- very little / slight
- absent

10 Tendency to corrode and stain metal

- unknown
- present and not controllable
- present but controllable
- absent

11 Staining of neighbouring materials

- unknown
- present and not controllable
- present but controllable
- absent

12 Tendency to splinter

- unknown
- serious
- very little / slight
- absent

13 Staining

- unknown
- difficult
- satisfactory or good after pre-treatment or newly machined
- good and even

14 Drying rate

- unknown
- very slow
- slow
- rather slow
- fairly rapid
- rapid

15 Tendency to checking

- unknown
- serious
- moderate
- slight
- absent

16 Tendency to distortion

- unknown
- serious
- moderate
- slight
- absent

17 Blunting effect on tools

- unknown
- severe if tipped cutters are used
- fairly severe
- moderate
- slight

18 Machining

- unknown
- difficult
- satisfactory when tipped cutters are used and/or modified cutting angle
- good

19 Nailing

- unknown
- difficult
- satisfactory: without pre-boring
- good: without pre-boring

20 Gluing

- unknown
- difficult
- satisfactory or good after pre-treatment or newly machined
- good

21 Effect of wood substances on finishing

- unknown
- serious
- present but controllable
- absent

22 Finishing

- unknown
- difficult
- satisfactory or good after pre-treatment or newly machined
- good

23 Hardwood (Yes or no)

- Hard
- Soft

APPENDIX B

Botanical names and trade names present in ALL.DBW (and FRA_ALL.DBW), supplemented with the names in LKSF3.DBW. These are included with an asterisk (*). Species not presumed to be present in Africa are listed in appendix C.

A

Afzelia africana	Afzelia, Doussié
Afzelia bipindensis, A.pachyloba	Afzelia, Doussié, Apa
Albizia adianthifolia *	Mepepe, Bangbaye, Saliyemo
Albizia ferruginae	Albizia, Iatandza
Albizia zygia *	Ouochi, Angoayeme
Alstonia boonei	Emien
Amphimas ferrugineus, A.pterocarpoides	Lati
Aningeria robusta *	Aningre, Abam
Anthonotha cladantha (=Macrolobium cladanthum) *	Akoung ele
Antiaris africana; A.welwitschii	Antiaris, Ako, Bonkonko
Antiaris toxicaria	Ako
Antrocaryon spp.	Onzabili
Aucoumea klaineana	Gaboon, Okoume
Autronella congolensis	Mukulungu

B

Baikiaea plurijuga	'Rhodesian teak', Mukusi
Beilschmiedia spp.	Kanda
Berlinia bracteosa, B.confusa, B.grandiflora	Ebiara
Berlinia spp.	Berlinia, Ebiara
Blighia welwitschii *	Awonog
Brachylaena hutchinsii	Muhuhu
Brachystegia cynometroides, B.leonensis	Naga
Brachystegia laurentii	Bomanga
Brachystegia nigerica	Okwen, Naga

C

Canarium schweinfurthii	Canarium, Aiélé
Casearia brideloides *	see Keayodendron bridelioides
Ceiba pentandra	Fuma
Celtis spp.	Celtis d'Afrique
Chlorophora excelsa; Chl.regia	Iroko, Kambala, Odum, Mvule
Cleistanthus polystachus *	Nom tonso
Cleistopholis patens *	Sobu, Avom
Coelocaryon preussii	Ekoune
Copaifera duckei, C.reticulata	Copaiba
Copaifera mildbraedii, C.salikounda	Etimoe

Copaifera mildbraedii, C.salikounda	Etimoe
Cordia plathythyrsa *	Cordia d'afrique, Ebe
Cylicodiscus gabunensis	Okan
Cynometra alexandri	Muhimbi
Cynometra hankei *	Nganga, Ekop Nganga, Okomlo

D

Dacryodes igaganga	Ossabel
Dacryodes normandii	Safoukala
Dacryodes pubescens, D.heterotrycha	Igaganga
Dacryodes spp.	Gommier
Daniella ogea, D.spp.	Ogea, Lonlaviol
Daniellia spp.	Faro
Desbordesia glaucescens *	Alep, Omang
Dialium dinklagei *	Eyoum P, Koumbele, Mfang P
Dialium spp *	Eyoum G, Mfang G
Didelotia africana, D.idae, D.letouzeyi	Gombe
Distemonanthus benthamianus	Ayan, Movingui

E

Enantia chlorantha *	Moambe jaune, Mfo
Entandrophragma angolense	Gedu nohor, Tiama
Entandrophragma cylindricum	Sapele, Sapeli, Aboudikro
Entandrophragma utile	Utile, Sipo
Erythrophleum ivorense; E.guineense	Missanda, Tali
Erythrophleum suavolensis, E.ivorense	Tali
Erythroxylum mannii *	Landa
Eucalyptus delegatensis	'Tasmanian oak', 'Alpine ash'

F

Fagara heitzii	Olon
Funtumia africana *	Mutondo, Ele-ndamba

G

Gambeya albida	White star apple, Longhi
Gambeya spp.	Longhi
Gilbertiodendron dewevrei	Limbali
Gossweilerodendron balsamiferum	Agba, Tola branca, Tola
Guarea cedrata	Guarea, Bossé
Guibourtia arnoldiana	Mutenye, Bengé
Guibourtia demeusei; G.tessmannii	Bubinga, Kevazingo

H

Hallea ciliata, H.stipulosa	Abura
Heritiera utilis ; H.densiflora	Nyankom, Niangon
Hevea brasiliensis	Rubberwood
Hevea spp.	Seringueira
Holoptelea grandis	Kekele

I

Irvingia grandifolia *	Andok ngoe, Zembila

J-K

Keayodendron bridelioides (=Casearia brideloides) *	Abip ele
Khaya ivorensis; K.anthotheca	Mahogany, African; Khaya mahogany
Klainedoxa gabonensis	Eveuss

L

Lannea welwitschii *	Kumbi
Lophira alata	Ekki, Azobé
Lovoa trichilioides *	Dibetou, Bibolo

M

Maesopsis emini	Musizi
Mammea africana *	Oboto, Abotzok
Maranthes inermis (= Parinari glabra) *	Assila omang
Microberlinia bisulcata *	Zingana, Zebra wood
Millettia laurentii	Wengé
Mitragyna (Hallea) ciliata *	Bahia, Elolom
Monopetalanthus spp.	Andoung
Morus mesozygia	Difou

N

Nauclea diderrichii	Opepe, Kusia, Bilinga
Nesogordonia papaverifera	Danta, Kotibé
Newtonia spp *	Ossimiale, Nom atui

O

Ocotea usambarensis	'East African campherwood'
Odyendyea gabonensis *	Ozek
Olea hochstetteri	East African olive, Musheragi
Oxystigma oxyphyllum	Tchitola, Tola, Lolagbolo, Tola mafuta

P

Paraberlinia bifoliolata	Awoura
Parinari glabra *	see *Maranthes inermis*
Penthaclethra eetveldeana *	Ebai bekwe
Pericopsis elata	Afrormosia, Kokrodua
Phyllanthus discoideus *	Ebebeng
Piptadeniastrum africanum	Dahoma, Dabéma
Poga oleosa	Ovoga
Pteleopsis hylodendron *	Sikon, Osanga
Pterocarpus angolensis	Muninga, Mukwa
Pterocarpus soyauxii	African padauk, Padauk, Camwood
Pterocarpus soyauxii, P.osun, P.tinctorius	Padouk
Pterygota spp.	Koto
Pycnanthus angolensis	Ilomba

Q-R

Rhodognaphalon brevicuspe	Kondroti
Ricinodendron heudelotii	Erimado, Essessang

S

Scottellia chevalieri, S.coriacea, S.spp.	Akossika
Scottellia coriacea	Odoko
Sindoropsis letestui	Gheombi
Spathodea campanulata	African tulip
Staudtia kamerunensis	Niove
Sterculia oblonga	Eyong, Yellow sterculia
Sterculia rhinopetala	Lotofa

T

Tectona grandis	Teak
Terminalia ivorensis	Idigbo, Framiré
Terminalia superba	Limba, Afara, Fraké
Testulea gabonensis	Izombé
Tetraberlinia bifoliolata, T.tubmaniana, T.polyphylla	Ekaba
Triplochiton scleroxylon	Obeche, Wawa, Abachi, Ayous
Turraeanthus africanus	Avodiré

U-V-W-X-Y-Z

APPENDIX C

Botanical names and trade names present in ALL.DBW (and FRA_ALL.DBW): Species not presumed to be present in Africa are listed here.

A

Alangium meyeri	Putian
Aldina heterophylla	Macucu de paca
Alexa grandiflora	Melanciera
Amburana cearensis; A.acreana	Amburana, Cerejeira
Andira coriacea, A.surinamensis	Angelin, Red cabbage wood
Andira spp.	Andira
Anisoptera spp.	Mersawa
Araucaria angustifolia	Pinheiro de Parana
Artocarpus ovata	Anubing
Aspidosperma peroba	Peroba rosa
Aspidosperma spp.	Araracanga

B

Bagassa guianensis; B.tiliaefolia	Tatajuba
Balfourodendron riedelianum	Pau marfim, Guatambu
Bertholletia excelsa	Castanheiro
Bowdichia nitida; Diplotropis purpurea	Sucupira, Sucupira preta
Brosimum rubescens	Satine

C

Calophyllum brasiliense	Santa Maria, Jacareuba
Carallia spp.	Meransi
Carapa guianensis; C.procera; C.spp.	Andiroba, Carapa, Crabwood, Krappa
Cariniana brasiliensis, C.integrifolia	Jequitiba
Cariniana pyriformis	Abarco
Caryocar glabrum, C.villosum	Piquia
Castanopsis spp.	Berangan
Casuarina equistifolia	Agoko
Cedrela spp.	Cedro
Cedrelinga catenaeformis	Tornillo
Celtis luzonica	Magabuyo
Clarisia racemosa	Guariuba
Copaifera multijuga	Copaiba
Couratari spp.	Tauari
Couroupita spp.	Macacarecuia
Cratoxylon arborescens	Geronggang
Ctenolophon parvifolius	Mertas

D

Dalbergia nigra	Rosewood, Rio rosewood, Jacandara
Dicorynia guyanensis; D.paraensis	Basralocus, Angelique
Didymopanax morototoni; Schefflera paraensis	Morototo
Dillenia philippinensis	Katmon
Dinizia excelsa	Angelim pedra, Angelim vermelho
Diplodiscus paniculatus	Balobo
Diplotropis purpurea	see *Bowdichia nitida*
Diplotropis spp.	Sucupira preta
Dipterocarpus spp.	Keruing, Yang, Dau, Gurjun, Apitong
Dipteryx spp.	Cumaru
Dryobalanops spp.	Kapur

Dipteryx spp.	Cumaru
Dryobalanops spp.	Kapur
Drypetes bordenii	Balikbikan
Duabanga moluccana	Loktob
Dyera costulata; D.lowii	Jelutong
E	
Enterolobium contortisiliquum, E.cyclocarpum, E.maximum	Tamboril
Enterolobium schomburgkii	Batibatra
Eperua falcata; E.spp.	Wallaba, Walaba
Eperua spp.	Wallaba
Erisma uncinatum	Quarubarana, Jatoby, Cambara
Euxylophora paraensis	Pau amarello
F-G	
Gmelina arborea	Melina, Yemane, Gumari
Gonystylus bancanus; G.spp.	Ramin, Melawis
Gonystylus macrophyllum	Lanutan bagyo
Goupia glabra	Goupi, Kabukalli, Kopie, Cupiuba
H	
Heritiera simplicifolia; H.spp.	Mengkulang, Kembang
Heritiera sylvatica	Dungon
Hura crepitans	Açacu
Hymenaea spp.	Jatoba
Hymenolobium spp.	Angelim
I	
Intsia palembanica, I.bijuga	Merbau
Irvingia malayana	Pauh kijang
J	
Jacaranda copaia	Para-para
K	
Koompassia excelsa	Menggis
Koompassia malaccensis	Kempas
Koordersiodendron pinnatum	Amugis
L	
Lagerstroemia piriformis	Batitinan
Lagerstroemia speciosa	Banaba
Letestua durissima	Congotali
M	
Mangifera altissima	Pahutan
Manilkara bidentata, M.spp.	Maçaranduba, Bolletrie
Maquira coriacea	Muiratinga
Marmaroxylon racemosum	Angelim rajado
Melia dubia	Bagalunga
Mesua ferrea	Penaga
Mezilaurus spp.	Itauba
Michelia platyphylla	Hangilo
Mora spp.	Mora
Myristica philippensis	Duguan
N	

Nectandra spp. / Ocotea spp.	Louro
Neobalanops heimii	Chengal

O

Ochroma lagopus	Balsa
Ocotea porosa	Imbuia
Ocotea rodiaei	Greenheart, Demerara greenheart
Ocotea rubra	Red louro, Determa, Wane, Louro vermelho
Ocotea rubra	Louro vermelho
Octomeles sumatrana	Binuang
Ormosia spp.	Tento

P

Palaquium spp.	Nyatoh
Parashorea malaanonan; P.tomentella	White seraya; white lauan (in part)
Parashorea stellata, P.densiflora	Meranti gerutu, Gerutu gerutu
Parkia spp.	Faveira
Peltogyne pubescens, P.spp.	Purpleheart
Peltogyne spp.	Amarante
Pittosporum pentandrum	Mamalis
Planchonia spectabilis	Lamog
Planchonia valida	Putat
Platonia insignis	Bacuri
Platymiscium ulei, P.pinnatum, P.trinitatis	Macacauba
Pometia pinanata	Malugai
Pometia pinnata	Kasai, Matoa
Prioria copaifera	Cativo
Protium spp.	Breu
Pseudosindora palustris	Sepetir
Pterocarpus dalbergioides	Andaman padauk, Padauk
Pterocarpus indicus	Sena
Pterocymbium tinctorium	Taluto
Pterygota horsfieldii	Impa

Q

Qualea albiflora, Q.dinizii	Quaruba, Kwarie
Qualea spp.	Mandioqueira

R-S

Sandoricum vidalii	Malasantol
Scleronema micranthum, S.praecox	Cardeiro
Shorea bracteolata, S.spp.	White meranti, White lauan (in part)
Shorea faguetiana, S.spp.	Yellow meranti, Yellow seraya
Shorea guiso, S.kunstleri, S.ochrophloia, S.collina	Red balau, Red selangan batu
Shorea negrosensis	Dark red lauan, Red lauan
Shorea pauciflora; S.spp.	Dark red meranti, Nemesu
Simarouba amara	Marupa
Sterculia spp.	Chicha
Streblus elengatus	Tempinis
Swartzia spp.	Coraçao de negro
Swietenia macrophylla	American mahogany, Mogno
Swietenia macrophylla, S.humilis	Mogno
Symphonia globulifera	Manil

T

Tabebuia serratifolia	Surinam greenheart, Ipé

Tabebuia spp.	Ipe
Tarrietia javanica, T.simplicifolia	Mengkulang
Tectona grandis	Teak
Terminalia copelandii	Lanipau
Tetragastris spp.	Sali
Tetramerista glabra	Punah
Tristania decorticata	Malabayabas

U-V

Virola spp.	Virola
Virola surinamensis; V.sebifera	Virola, Baboen, Ucuuba
Vochysia maxima; V.spp.	Quaruba, Kwarie, Yemeri
Vouacapoua americana	Acapu, Wacapou, Partridgewood

W

Walaceodendron celebicum	Banuyo

X-Y-Z

Xantophyllum excelsum	Bok-bok

APPENDIX D

Timber species: Trade names of African timber species.
The added species are included in **bold** typeface.

A

Abam	*Aningeria robusta*
Abip ele	*Keayodendron bridelioides (=Casearia brideloides)*
Abotzok	*Mammea africana*
Aboudikro	*Entandrophragma cylindricum*
Abura	*Hallea ciliata, H.stipulosa*
Afara	*Terminalia superba*
African mahogany	*Khaya ivorensis; K.anthotheca*
African padauk	*Pterocarpus soyauxii*
African tulip	*Spathodea campanulata*
Afrormosia	*Pericopsis elata*
Afzelia	*Afzelia bipindensis, A.pachyloba*
Afzelia	*Afzelia africana*
Agba	*Gossweilerodendron balsamiferum*
Aiélé	*Canarium schweinfurthii*
Ako	*Antiaris toxicaria*
Ako	*Antiaris africana; A.welwitschii*
Akossika	*Scottellia chevalieri, S.coriacea, S.spp.*
Albizia	*Albizia ferruginae*
Alep	*Desbordesia glaucescens*
Amugis	*Koordersiodendron pinnatum*
Andok ngoe	*Irvingia grandifolia*
Andoung	*Monopetalanthus spp.*
Angoayeme	*Albizia zygia*
Aningre	*Aningeria robusta*
Antiaris	*Antiaris africana; A.welwitschii*
Apa	*Afzelia bipindensis, A.pachyloba*
Assila omang	*Maranthes inermis (= Parinari glabra)*
Avodiré	*Turraeanthus africanus*
Avom	*Cleistopholis patens*
Awonog	*Blighia welwitschii*
Awoura	*Paraberlinia bifoliolata*
Ayan	*Distemonanthus benthamianus*
Ayous	*Triplochiton scleroxylon*
Azobé	*Lophira alata*

B

Bahia	*Mitragyna (Hallea) ciliata*
Bangbaye	*Albizia adianthifolia*
Bengé	*Guibourtia arnoldiana*
Berlinia	*Berlinia spp.*
Bété	*Mansonia altissima*
Bibolo	*Lovoa trichilioides*
Bilinga	*Nauclea diderrichii*

Bomanga	*Brachystegia laurentii*
Bonkonko	*Antiaris africana; A.welwitschii*
Bossé	*Guarea cedrata*
Bubinga	*Guibourtia demeusei; G.tessmannii*

C

Camwood	*Pterocarpus soyauxii*
Canarium	*Canarium schweinfurthii*
Celtis d'Afrique	*Celtis spp.*
Congotali	*Letestua durissima*
Corail	*Pterocarpus soyauxii*
Cordia d'afrique	*Cordia plathythyrsa*

D

Dabéma	*Piptadeniastrum africanum*
Dahoma	*Piptadeniastrum africanum*
Danta	*Nesogordonia papaverifera*
Dibetou	*Lovoa trichilioides*
Difou	*Morus mesozygia*
Doussié	*Afzelia bipindensis, A.pachyloba*
Doussié	*Afzelia africana*

E

East African olive	*Olea hochstetteri*
East African campherwood	*Ocotea usambarensis*
Ebai bekwe	*Penthaclethra eetveldeana*
Ebe	*Cordia plathythyrsa*
Ebebeng	*Phyllanthus discoideus*
Ebiara	*Berlinia spp.*
Ebiara	*Berlinia bracteosa, B.confusa, B.grandiflora*
Ekaba	*Tetraberlinia bifoliolata, T.tubmaniana, T.polyphylla*
Ekki	*Lophira alata*
Ekop Nganga	*Cynometra hankei*
Ekoune	*Coelocaryon preussii*
Ele-ndamba	*Funtumia africana*
Elolom	*Mitragyna (Hallea) ciliata*
Emien	*Alstonia boonei*
Erimado	*Ricinodendron heudelotii*
Essessang	*Ricinodendron heudelotii*
Etimoe	*Copaifera mildbraedii, C.salikounda*
Eveuss	*Klainedoxa gabonensis*
Eyong	*Sterculia oblonga*
Eyoum P	*Dialium dinklagei*
Eyoum G	*Dialium spp*

F

Faro	*Daniellia spp.*
Fraké	*Terminalia superba*
Framiré	*Terminalia ivorensis*
Fuma	*Ceiba pentandra*

G

Gaboon	*Aucoumea klaineana*
Gedu nohor	*Entandrophragma angolense*
Gheombi	*Sindoropsis letestui*
Gombe	*Didelotia africana, D.idae, D.letouzeyi*
Gommier	*Dacryodes spp.*
Guarea	*Guarea cedrata*

H

Iatandza	*Albizia ferruginae*
Idigbo	*Terminalia ivorensis*
Igaganga	*Dacryodes pubescens, D.heterotrycha*
Ilomba	*Pycnanthus angolensis*
Iroko	*Chlorophora excelsa; Chl.regia*
Izombé	*Testulea gabonensis*

I-J-K

Kambala	*Chlorophora excelsa; Chl.regia*
Kanda	*Beilschmiedia spp.*
Kekele	*Holoptelea grandis*
Kevazingo	*Guibourtia demeusei; G.tessmannii*
Khaya mahogany	*Khaya ivorensis; K.anthotheca*
Kokrodua	*Pericopsis elata*
Kondroti	*Rhodognaphalon brevicuspe*
Koumbele	*Dialium dinklagei*
Kotibé	*Nesogordonia papaverifera*
Koto	*Pterygota spp.*
Kumbi	*Lannea welwitschii*
Kusia	*Nauclea diderrichii*

L

Landa	*Erythroxylum mannii*
Lati	*Amphimas ferrugineus, A.pterocarpoides*
Limba	*Terminalia superba*
Limbali	*Gilbertiodendron dewevrei*
Lolagbolo	*Oxystigma oxyphyllum*
Longhi	*Gambeya spp.*
Longhi	*Gambeya albida*
Lonlaviol	*Daniella ogea, D.spp.*
Lotofa	*Sterculia rhinopetala*

M

Mansonia	*Mansonia altissima*
Mepepe	*Albizia adianthifolia*
Mfang G	*Dialium spp*
Mfang P	*Dialium dinklagei*
Mfo	*Enantia chlorantha*
Missanda	*Erythrophleum ivorense; E.guineense*
Moambe jaune	*Enantia chlorantha*

Mora	*Mora spp.*
Movingui	*Distemonanthus benthamianus*
Muhimbi	*Cynometra alexandri*
Muhuhu	*Brachylaena hutchinsii*
Mukulungu	*Autronella congolensis*
Mukwa	*Pterocarpus angolensis*
Muninga	*Pterocarpus angolensis*
Musheragi	*Olea hochstetteri*
Musizi	*Maesopsis emini*
Mutenye	*Guibourtia arnoldiana*
Mutondo	*Funtumia africana*
Mvanda	*Hylodendron gabunense*
Mvule	*Chlorophora excelsa; Chl.regia*

N

Naga	*Brachystegia nigerica*
Naga	*Brachystegia cynometroides, B.leonensis*
Nganga	*Cynometra hankei*
Niove	*Staudtia kamerunensis*
Nkoul	*Mansonia altissima*
Nom atui	*Newtonia spp*
Nom tonso	*Cleistanthus polystachus*

O

Obeche	*Triplochiton scleroxylon*
Oboto	*Mammea africana*
Odoko	*Scottellia coriacea*
Odum	*Chlorophora excelsa; Chl.regia*
Ogea	*Daniella ogea, D.spp.*
Okan	*Cylicodiscus gabunensis*
Okomlo	*Cynometra hankei*
Okoume	*Aucoumea klaineana*
Okwen	*Brachystegia nigerica*
Olon	*Fagara heitzii*
Omang	*Desbordesia glaucescens*
Onzabili	*Antrocaryon spp.*
Opepe	*Nauclea diderrichii*
Osanga	*Pteleopsis hylodendron*
Ossabel	*Dacryodes igaganga*
Ossimiale	*Newtonia spp*
Ouochi	*Albizia zygia*
Ovoga	*Poga oleosa*
Ozek	*Odyendyea gabonensis*

P

Padauk	*Pterocarpus soyauxii*
Padauk	*Pterocarpus dalbergioides*
Padouk	*Pterocarpus soyauxii, P.osun, P.tinctorius*

Q-R

Rhodesian teak	*Baikiaea plurijuga*
Rubberwood	*Hevea brasiliensis*

S

Safoukala	*Dacryodes normandii*
Sali	*Tetragastris spp.*
Saliyemo	*Albizia adianthifolia*
Sapele	*Entandrophragma cylindricum*
Sapeli	*Entandrophragma cylindricum*
Sikon	*Pteleopsis hylodendron*
Sipo	*Entandrophragma utile*
Sobu	*Cleistopholis patens*

T

Tali	*Erythrophleum ivorense; E.guineense*
Tchitola	*Oxystigma oxyphyllum*
Teak	*Tectona grandis*
Tiama	*Entandrophragma angolense*
Tola	*Oxystigma oxyphyllum*
Tola	*Gossweilerodendron balsamiferum*
Tola branca	*Gossweilerodendron balsamiferum*
Tola mafuta	*Oxystigma oxyphyllum*

U

Utile	*Entandrophragma utile*

V-W

Wawa	*Triplochiton scleroxylon*
Wengé	*Millettia laurentii*
White star apple	*Gambeya albida*

X-Y

Yellow sterculia	*Sterculia oblonga*

Z

Zingana	*Microberlinia bisuculata*
Zembila	*Irvingia grandifolia*
Zebra wood	*Microberlinia bisuculata*

APPENDIX E

Condensed results from African species screened for specific western European end-uses.

Resulting classifications

The result of the property/requirement screening is primarily expressed by "acceptable" or "not-acceptable" classifications for one of the two levels. These parameters result in a final outcome concerning the suitability or non-suitability of a timber species for one of the specific end-uses. A refinement in the procedure is included to differentiate the final result of the screening and ranking procedure by producing a "practical evaluation" in functional and practical terms of interpretation (such as "a perfect species", "a good species", "an unacceptable species", etc).
Cameroonian species that have been added are marked with an asterisk.

Botanical name	best rating for the end-use(s)	
Afzelia africana	good	window-frames
Afzelia bipindensis, A.pachyloba	good	window-frames
Albizia adianthifolia *	doubtful/unsuitable	window-frames and doors and cladding and furniture and light flooring and heavy flooring
Albizia ferruginae	good	window-frames and cladding and furniture
Albizia ferruginae	fairly good	furniture and light flooring and heavy flooring
Albizia zygia *	doubtful/unsuitable	window-frames and doors and cladding and furniture and light flooring and heavy flooring
Alstonia boonei	doubtful/unsuitable	window-frames and cladding and light flooring and heavy flooring
Amphimas ferrugineus, A.pterocarpoides	unacceptable	window-frames and cladding
Aningeria robusta *	good	window-frames and cladding and furniture
Anthonotha cladantha (=Macrolobium cladanthum) *	unacceptable	window-frames and doors and cladding and furniture and light flooring and heavy flooring
Antiaris africana, A.welwitschii	doubtful/unsuitable	window-frames and cladding
Antiaris toxicaria	doubtful/unsuitable	window-frames and cladding and furniture and light flooring and heavy flooring
Antrocaryon spp.	good	window-frames and cladding and furniture and light flooring
Aucoumea klaineana	doubtful/unsuitable	window-frames and cladding
Autronella congolensis	doubtful/unsuitable	furniture
Baikiaea plurijuga	very good	light flooring and heavy flooring
Beilschmiedia spp.	doubtful/unsuitable	window-frames
Berlinia bracteosa, B.confusa, B.grandiflora	good	window-frames and furniture and light flooring and heavy flooring
Berlinia spp.	doubtful/unsuitable	window-frames and cladding and furniture and light flooring and heavy flooring
Blighia welwitschii *	doubtful/unsuitable	furniture and light flooring and heavy flooring
Brachylaena hutchinsii	doubtful/unsuitable	furniture
Brachystegia cynometroides, B.leonensis	doubtful/unsuitable	window-frames and cladding and furniture and light flooring and heavy flooring
Brachystegia laurentii	doubtful/unsuitable	window-frames and doors and cladding and furniture and light flooring and heavy flooring
Brachystegia nigerica	doubtful/unsuitable	window-frames and doors and cladding and furniture and light flooring and heavy flooring

Canarium schweinfurthii	doubtful/unsuitable	window-frames and doors and cladding and furniture and light flooring and heavy flooring
Canarium schweinfurthii	unacceptable	window-frames and cladding and furniture and light flooring and heavy flooring
Cedrela spp.	good	window-frames and doors and cladding and furniture
Ceiba pentandra	doubtful/unsuitable	window-frames and cladding
Celtis spp.	doubtful/unsuitable	cladding and furniture and light flooring and heavy flooring
Chlorophora excelsa, Chl.regia	good	window-frames and doors and cladding and furniture and light flooring
Cleistanthus polystachus *	unacceptable	window-frames and doors and cladding and furniture and light flooring and heavy flooring
Cleistopholis patens *	doubtful/unsuitable	window-frames and doors and cladding
Coelocaryon preussii	good	window-frames and cladding and furniture
Copaifera mildbraedii, C.salikounda	doubtful/unsuitable	window-frames and cladding and furniture and light flooring and heavy flooring
Cordia plathythyrsa *	doubtful/unsuitable	window-frames and cladding
Cylicodiscus gabunensis	doubtful/unsuitable	cladding
Cylicodiscus gabunensis	unacceptable	cladding
Cynometra alexandri	doubtful/unsuitable	window-frames and doors and cladding and furniture and light flooring and heavy flooring
Cynometra hankei *	unacceptable	window-frames and doors and cladding and furniture and light flooring and heavy flooring
Dacryodes igaganga	fairly good	window-frames and furniture and light flooring
Dacryodes normandii	good	window-frames and furniture
Dacryodes pubescens, D.heterotrycha	doubtful/unsuitable	furniture and light flooring and heavy flooring
Daniella ogea, D.spp.	good	window-frames and cladding and furniture
Daniellia spp.	good	cladding
Desbordesia glaucescens *	doubtful/unsuitable	window-frames
Dialium dinklagei *	doubtful/unsuitable	window-frames
Dialium spp. *	doubtful/unsuitable	window-frames
Didelotia africana, D.idae, D.letouzeyi	good	window-frames and cladding and furniture and light flooring
Distemonanthus benthamianus	good	window-frames and doors and furniture and light flooring
Distemonanthus benthamianus	good	window-frames and doors and furniture and light flooring
Enantia chlorantha *	doubtful/unsuitable	window-frames and cladding
Entandrophragma angolense	perfect	window-frames
Entandrophragma cylindricum	doubtful/unsuitable	cladding
Entandrophragma utile	good	window-frames and cladding and furniture and light flooring
Erythrophleum ivorense, E.guineense	doubtful/unsuitable	cladding
Erythrophleum suavolensis, E.ivorense	unacceptable	window-frames and cladding
Erythroxylum mannii *	good	window-frames and cladding and furniture and light flooring
Eucalyptus delegatensis	good	window-frames and furniture
Fagara heitzii	good	window-frames and doors and cladding and furniture
Funtumia africana *	doubtful/unsuitable	window-frames and cladding and furniture and light flooring and heavy flooring
Gambeya albida	good	window-frames and furniture and light flooring and heavy flooring
Gambeya spp.	doubtful/unsuitable	window-frames and cladding and furniture and light flooring and heavy flooring
Gilbertiodendron dewevrei	doubtful/unsuitable	window-frames and cladding and furniture and light flooring and heavy flooring
Gossweilerodendron balsamiferum	good	window-frames and cladding
Gossweilerodendron balsamiferum	good	furniture
Guarea cedrata	good	window-frames and doors and cladding and furniture

Guibourtia arnoldiana	doubtful/unsuitable	furniture and light flooring and heavy flooring
Guibourtia arnoldiana	good	window-frames and furniture
Guibourtia demeusei, G.tessmannii	doubtful/unsuitable	furniture and light flooring and heavy flooring
Hallea ciliata, H.stipulosa	good	window-frames and furniture
Heritiera utilis, H.densiflora	good	window-frames and doors and cladding and furniture and light flooring
Hevea spp.	doubtful/unsuitable	window-frames and doors and cladding and furniture and light flooring and heavy flooring
Holoptelea grandis	doubtful/unsuitable	window-frames and cladding and furniture and light flooring and heavy flooring
Hylodendron gabunense *	doubtful/unsuitable	window-frames and doors and furniture and light flooring and heavy flooring
Irvingia grandifolia *	fairly good	window-frames and light flooring and heavy flooring
Keayodendron bridelioides (=Casearia brideloides) *	unacceptable	window-frames and doors and cladding and furniture and light flooring and heavy flooring
Khaya ivorensis, K.anthotheca	good	window-frames and cladding and furniture
Klainedoxa gabonensis	unacceptable	cladding and furniture
Lannea welwitschii *	doubtful/unsuitable	light flooring and heavy flooring
Letestua durissima	doubtful/unsuitable	window-frames and furniture and light flooring and heavy flooring
Lophira alata	doubtful/unsuitable	window-frames
Lovoa trichilioides *	good	furniture
Maesopsis emini	good	window-frames and cladding
Mammea africana *	doubtful/unsuitable	window-frames and doors and cladding.
Mansonia altissima *	good	window-frames and doors and cladding and furniture and light flooring
Maranthes inermis (= Parinari glabra) *	unacceptable	window-frames and doors and cladding and furniture and light flooring and heavy flooring
Microberlinia bisulcata *	good	window-frames and doors and furniture and light flooring and heavy flooring
Millettia laurentii	good	window-frames
Mitragyna (Hallea) ciliata *	good	window-frames and furniture
Monopetalanthus spp.	doubtful/unsuitable	window-frames and cladding and furniture and light flooring and heavy flooring
Morus mesozygia	good	window-frames
Nauclea diderrichii	doubtful/unsuitable	window-frames and doors and cladding and furniture and light flooring and heavy flooring
Nauclea diderrichii	doubtful/unsuitable	window-frames
Nesogordonia papaverifera	good	window-frames and doors and cladding and furniture and light flooring and heavy flooring
Newtonia spp *	unacceptable	window-frames and doors and cladding and furniture and light flooring and heavy flooring
Ocotea usambarensis	good	window-frames and doors and cladding and furniture
Odyendyea gabonensis *	unacceptable	cladding
Olea hochstetteri	doubtful/unsuitable	cladding and furniture and light flooring and heavy flooring
Oxystigma oxyphyllum	good	furniture
Oxystigma oxyphyllum	good	window-frames and cladding and furniture and light flooring
Paraberlinia bifoliolata	good	window-frames
Penthaclethra eetveldeana *	doubtful/unsuitable	cladding
Pericopsis elata	good	window-frames and doors and furniture and light flooring and heavy flooring
Phyllanthus discoideus *	doubtful/unsuitable	light flooring and heavy flooring
Piptadeniastrum africanum	doubtful/unsuitable	window-frames and cladding and furniture and light flooring and heavy flooring
Piptadeniastrum africanum	doubtful/unsuitable	window-frames and cladding and furniture and light flooring and heavy flooring
Piptadeniastrum africanum	doubtful/unsuitable	cladding
Poga oleosa	good	window-frames and cladding
Pteleopsis hylodendron *	doubtful/unsuitable	window-frames and doors and cladding and furniture and light flooring and heavy flooring
Pterocarpus angolensis	perfect	window-frames and doors
Pterocarpus soyauxii	perfect	doors

Pterocarpus soyauxii, P.osun, P.tinctorius	good	window-frames and doors and furniture and light flooring and heavy flooring
Pterygota spp.	good	window-frames and cladding and furniture and light flooring
Pycnanthus angolensis	doubtful/unsuitable	window-frames and cladding and furniture and light flooring and heavy flooring
Pycnanthus angolensis	doubtful/unsuitable	window-frames and cladding and furniture and light flooring and heavy flooring
Rhodognaphalon brevicuspe	good	window-frames and cladding
Ricinodendron heudelotii	doubtful/unsuitable	window-frames and cladding
Scottellia chevalieri, S.coriacea, S.spp.	doubtful/unsuitable	furniture and light flooring and heavy flooring
Scottellia coriacea	doubtful/unsuitable	window-frames and cladding and furniture and light flooring and heavy flooring
Sindoropsis letestui	good	window-frames and doors and cladding and furniture and light flooring and heavy flooring
Sindoropsis letestui	fairly good	window-frames and furniture and light flooring and heavy flooring
Staudtia kamerunensis	doubtful/unsuitable	window-frames
Sterculia oblonga	doubtful/unsuitable	window-frames and cladding and furniture and light flooring and heavy flooring
Sterculia rhinopetala	doubtful/unsuitable	cladding and light flooring and heavy flooring
Tectona grandis	good	window-frames and doors
Terminalia ivorensis	good	window-frames and doors and cladding
Terminalia superba	good	window-frames and doors and cladding and furniture
Terminalia superba	good	window-frames and cladding and furniture
Testulea gabonensis	doubtful/unsuitable	window-frames and cladding and furniture and light flooring and heavy flooring
Tetraberlinia bifoliolata, T.tubmaniana, T.polyphylla	good	window-frames and cladding and light flooring
Triplochiton scleroxylon	doubtful/unsuitable	window-frames and cladding
Turraeanthus africanus	doubtful/unsuitable	window-frames and doors and cladding and furniture and light flooring and heavy flooring